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THE NEW INTERNATIONAL ENCYCLOPÆDIA

SECOND EDITION

VOLUME VIII

NEW YORK
DODD, MEAD AND COMPANY
1930

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Vail-Ballou Press, Inc., Binghamton, N. Y.
J. F. Tapley Co., Long Island City, N. Y.

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KEY TO PRONUNCIATION

For a full explanation of the various sounds indicated, see the KEY TO PRONUNCIATION in Vol. I.

ā as in ale, fate.
ā̇ " " senate, chaotic.
â " " glare, care, and as *e* in there.
ă " " am, at.
ä " " arm, father.
ȧ " " ant, and final *a* in America, armada, etc.
a " " final, regal, pleasant.
a̤ " " all, fall.
ē " " eve.
ė̄ " " elate, evade.
ĕ " " end, pet.
ẽ " " fern, her, and as *i* in sir, etc.
e " " agency, judgment.
ī " " ice, quiet.
ī̇ " " quiescent.
ĭ " " ill, fit.
ō " " old, sober.
ō̇ " " obey, sobriety.
ô " " orb, nor.
ŏ " " odd, forest, not.
o " " atom, carol.
oi " " oil, boil.
o͞o " " food, fool, and as *u* in rude, rule.
ou " " house, mouse.
ū " " use, mule.
ū̇ " " unite.
ŭ " " cut, but.
ṳ " " full, put, or as *oo* in foot, book.
û " " urn, burn.
y " " yet, yield.
B " " Spanish Habana, Córdoba, where it is like English *v* but made with the lips alone.

ch as in chair, cheese.
D " " Spanish Almodovar, pulgada, where it is nearly like *th* in English then.
g " " go, get.
G " " German Landtag = *ch* in Ger. ach, etc.
H " *j* in Spanish Jijona, *g* in Spanish gila; like English *h* in hue, but stronger.
hw " *wh* in which.
K " *ch* in German ich, Albrecht = *g* in German Arensberg, Mecklenburg, etc.
n̲ " in sinker, longer.
ng " " sing, long.
N " " French bon, Bourbon, and *m* in the French Étampes; here it indicates nasalising of the preceding vowel.
sh " " shine, shut.
th " " thrust, thin.
TH " " then, this.
zh " *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used as in tā'b'l (table), kăz"m (chasm), to indicate the elision of a vowel or its reduction to a mere murmur.

For foreign sounds, the nearest English equivalent is generally used. In any case where a special symbol, as G, H, K, N, is used, those unfamiliar with the foreign sound indicated may substitute the English sound ordinarily indicated by the letter. For a full description of all such sounds, see the article on PRONUNCIATION.

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THE NEW INTERNATIONAL ENCYCLOPÆDIA

ENTERI′TIS (Neo-Lat., from Gk. *ἔντερον, enteron*, intestine). Inflammation of the bowels, and especially of their muscular and serous coat, accompanied by pain, colic (q.v.), and diarrhœa (q.v.), or dysentery (q.v.). Enteritis in children (see CHOLERA INFANTUM) is often fatal. It attacks the entire digestive tract, generally being a gastroenteritis. Abstinence from food, washing the colon with large enemata of water, and sterilization of drinking water are essential in the treatment of these cases. In adults enteritis is benefited by mild purgation, followed by opiates and fasting. If the colon is attacked, the term used is *colitis*, properly a subdivision of enteritis. *Typhlitis* is an inflammation of and about the cæcum (q.v.), and *appendicitis* (see VERMIFORM APPENDIX) is an inflammation of the appendix. These are dangerous and frequently fatal. Rest, opiates, and poultices or ice may ameliorate some cases. Operation is generally necessary in appendicitis. In all cases the diagnosis and treatment must be left to the physician.

In the Lower Animals. Inflammation of the bowels, among the heavier breeds of horses, generally results from some error of diet, such as a long fast, followed by a large, hastily devoured meal, indigestible or easily fermentable food, or large drafts of water at improper times. When thus produced, it is frequently preceded by stomach staggers or colic, affects chiefly the mucous coat of the large intestines, and often runs its course in from 8 to 12 hours. With increasing fever and restlessness, the pulse soon rises to 70 or upward, and in this respect, unlike colic, continues throughout considerably above the natural standard of 40 beats per minute. The pain is great, but the animal, instead of recklessly throwing himself about as in colic, arises and lies down cautiously. When standing, the horse frequently turns his head backward and looks at his flanks. Respiration is quickened, the bowels are torpid. Cold sweats, stupor, and occasionally delirium, precede death. When connected with, or occurring as a sequel to, influenza, laminitis, and other complaints, the small intestines are as much affected as the large, and the peritoneal as well as the mucous coat of the bowels. This form is more common in the lighter breeds. When the patient is seen early, while the pulse is still clear and distinct and not above 60, and the legs and ears are warm, bloodletting is useful, as it relieves the overloaded vessels, and prevents that exudation of blood which speedily exudes into the interior of the bowels in cases of hemorrhagic enteritis. This disease should be treated as follows: In a pint of oil, or an infusion of two drams of aloes in hot water, give a scruple of calomel and an ounce of laudanum, and repeat the calomel and laudanum every hour in gruel until the bowels are opened, or until five or six doses are given. Encourage the action of the bowels by using, every half hour, soap-and-water clysters, to which add laudanum so long as pain and straining continue. If the animal is nauseated and stupid, with a cold skin, weak, quick pulse, bleeding and reducing remedies are very injurious; and the only hope lies in following up one dose of the calomel and aloes with small doses of laudanum and sweet spirit of nitre, or other stimulants, repeated every 40 minutes. In all stages woolen cloths wrung out of hot water and applied to the belly encourage the action of the bowels and relieve the pain.

Enteritis in cattle is produced by coarse, wet pasture, acrid or poisonous plants, bad water, and overdriving. The symptoms are fever and thirst, a quick but rather weak pulse, restless twitching up of the hind limbs, tenderness of the belly, torpidity of the bowels, and cessation of rumination. Calves generally die in three or four days, other cattle in a week or nine days. Bleed early, open the bowels with a pint of oil and a dram of calomel, which may be repeated in 8 or 10 hours if no effect is produced. Give, every hour, 15 drops of Fleming's tincture of aconite in water, until six or seven doses are given. Allow only sloppy and laxative food, such as molasses, gruel, or a thin bran mash; employ clysters and hot cloths to the belly and use two-ounce doses of laudanum if the pain is great. Enteritis in sheep mostly occurs in cold, exposed localities, and where flocks are subjected to great privations or improper feeding.

EN′TEROHEP′ATI′TIS. See BLACKHEAD.

ENTFÜHRUNG AUS DEM SERAIL, DIE, ĕnt-fụ′rụng ous dem sȧ-rī′ *or* sȧ-rīl′ (Il Seraglio). An opera by Mozart (q.v.), first produced in Vienna, July 13, 1782; in the United States, October, 1862 (New York).

EN′THYMEME (Gk. *ἐνθύμημα, enthymēma*, argument, from *ἐνθυμεῖσθαι, enthymeisthai*, to ponder, from *ἐν, en*, in + *θυμός, thymos*, mind). A term used by Aristotle to denote a syllogism "from probabilities and signs"; now a technical name in logic for a syllogism with one of its premises or its conclusion unexpressed. For instance, "The steamship *Rio Janeiro* could not have been built in water-tight compartments, for it sank in 15 minutes"—the suppressed premise being, "No steamship built in water-tight compartments sinks in 15 minutes." Almost all ordinary argumentation is conducted in enthymemes. See DEDUCTION; LOGIC.

ENTIRE′TY (from *entire*, OF., Fr. *entier*, It. *intero*, from Lat. *integer*, whole, from *in*, not + *tangere*, to touch), TENANCY BY. The form of joint estate which subsists between husband and wife. Like the ordinary joint estate, it arises upon a conveyance or devise to the two persons together who are to hold the premises, and, like that also, it is attended with the right of survivorship, as incident to the estate, the interest of the one dying first passing to the other and not to the heirs of the decedent. But the circumstance that the joint tenants are here husband and wife, and have therefore identical interests in the property, has differentiated the tenancy by entirety in some important respects from joint tenancy proper. The joint tenant may ordinarily convey his interest separately from his cotenants, thereby dissolving the joint estate and destroying the right of survivorship. But this is not permitted in the case of a tenancy of the entirety; neither can the estate be partitioned during the existence of the marriage relation, though it is dissolved by a divorce and the parties thereupon converted into joint tenants or tenants in common, usually the latter.

The estate is one which is much favored by the law, and it has accordingly been generally held that it is not affected by statutes abolishing joint tenancies, or creating a presumption in favor of tenancies in common; nor yet by the more recent legislation known as the married women's acts, whereby a wife is rendered capable of holding and conveying real estate free from the control of her husband. But in a few States the contrary view has been taken, and in a few others the tenancy by entirety has never been recognized. In most of the United States, however, the estate still exists without material change in the characteristics which it had at the common law. See HUSBAND AND WIFE, and the authorities there referred to.

ENTOMB′MENT, THE. A frequent subject of paintings, representing the burial of Christ. One of the most celebrated is that by Raphael, painted in 1507, for the church of San Francesco, Perugia, and now in the Palazzo Borghese, Rome. The finest representation of the subject is by Titian in the Louvre (1523). It shows the body of Christ suspended in a cloth, borne to the sepulchre by Nicodemus and Joseph of Arimathea. St. John supports one arm, and to the left are the Virgin and the Magdalen. It is a consummate masterpiece, not only in technique (the composition, color, and chiaroscuro being especially effective), but as a sublime and profound expression of religious feeling. Another example by Titian (1559) is now in the Madrid Gallery. Tintoretto also painted two masterly pictures on the subject—one in the Parma Gallery, the other in San Francesco della Vigna, Venice. Caravaggio's celebrated "Entombment" (see CARAVAGGIO for reproduction) is in the Vatican Gallery. Other well-known representations of the subject are by the Italian masters Gaudenzio Ferrari (Turin), Annibale Carracci (Louvre), Garafalo (Palazzo Borghese, Rome), and the sculptor Donatello (South Kensington Museum, London); and by the Flemish painters Rogier van der Weyden (Uffizi, Florence), Quentin Matsys (Antwerp), and Van Dyck (Antwerp).

ENTOMIS, ĕn′tŏ-mĭs. A genus of minute fossil ostracods with subovate or fabiform shell, the valves of which are characterized by a deep submedian vertical furrow extending to the hinge line. The genus ranges from the Ordovician to the Carboniferous period, but its remains are most profuse in the Devonian strata. The species *Entomis serrato-striata* composes certain beds of the Upper Devonian of middle Europe. See OSTRACODA.

ENTOMOLOG′ICAL SOCIETY, AMERICAN. An organization for the investigation of the character and habits of insects, founded at Philadelphia in 1859, incorporated in 1862, and known until 1867 as the Entomological Society of Philadelphia. The results of its investigations are published in its *Proceedings* and *Transactions*, beginning in 1861, and also in the *Entomological News*, the latter issued monthly with the coöperation of the entomological section of the Academy of Natural Sciences of Philadelphia. It owns a valuable entomological collection and library. Membership in 1914 was about 140.

EN′TOMOL′OGY (Neo-Lat. *entomologia*, from Gk. *ἔντομον*, *entomon*, insect, from *ἐν*, *en*, in + *τομή*, *tomē*, a cutting, from *τέμνειν*, *temnein*, to cut + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). That part of the science of zoölogy which treats of insects. See INSECT.

EN′TOMOPH′ILOUS PLANT (from Gk. *ἔντομον*, *entomon*, insect + *φίλος*, *philos*, dear, from *φιλεῖν*, *philein*, to love). A plant whose pollen is carried from one flower to another by means of insects. A contrasting phrase is "anemophilous plant," meaning one whose pollen is carried about by the wind. See POLLINATION.

ENTOMOPHTHORALES, ĕn′tŏ-mŏf′thŏ-rā′lēz (Neo-Lat., from Gk. *ἔντομον*, *entomon*, insect + *φθορά*, *phthora*, destruction). A group of parasitic fungi fatal to insects, the common house fly often being destroyed by them. The spore in germination sends out a tube that penetrates the body of the insect, which finally becomes filled with the mycelium of the fungus. The dead bodies of flies may be seen adhering to a windowpane often surrounded by a halo of spores.

EN′TOMOS′TRACA (Neo-Lat. nom. pl., from Gk. *ἔντομον*, *entomon*, insect + *ὄστρακον*, *ostrakon*, shell). One of the two subclasses of crustaceans (q.v.). Many of them are minute and exist in great numbers both in fresh and salt water, particularly in stagnant or nearly stagnant fresh water, affording to many kinds of fishes their principal food. They differ much in general form; the number of organs of locomotion is also various—in some, few; in some, more than 100—usually adapted for swimming only and attached to the posterior as well as to the anterior segments; but there never is a fin-like expansion of the tail, as in some of the malacostracous crustaceans. The body is divisible into two parts, a head and a trunk, but the latter shows no differentiation into thorax and abdomen. The antennæ are generally well developed and are often used, especially the second pair, as organs of locomotion. Some of the Entomostraca have mouths fitted for mastication and some for suction. Not a few are parasitic. The heart has the form of a long vessel. The organs of respiration are in certain species attached to some of the organs of locomotion, in the form of hairs, often grouped into beards, combs, or tufts; or bladelike expansions of the anterior legs are subservient to the purpose of respiration; in others no special organs of respiration are known to exist. The nervous system, like that of most arthropoda (q.v.), consists of a brain or supra-œsophageal ganglion and a more or less elongated double ventral cord connected with it by a commissure on each side of the œsophagus and provided with six or seven pairs of ganglia. In most entomostracans, however, the nervous system is more concentrated, sometimes to such an extent that it consists of a single ganglionic mass, through which the œsophagus passes. The eyes are of two distinct sorts; nearly all the species have a median unpaired eye, sometimes well developed and sometimes greatly reduced. Many forms also have a pair of lateral eyes, which are sometimes stalked. The name Entomostraca has been given to these creatures in consequence of most of the species having shells of many pieces, rather horny than calcareous, and very delicate, generally almost membranous and transparent. In many the shell consists of two valves, including more or less of the body, capable of being completely closed, but which, at the pleasure of the animal, can also be opened so as to permit the antennæ and feet to be stretched out.

The Entomostraca comprise many thousand species, which are readily grouped in four great orders, according to the arrangement and structure of the shell and appendages: PHYLLOPODA; OSTRACODA; COPEPODA; CIRRIPEDIA (qq.v.).

EN'TOPHYTE. See ENDOPHYTE.

EN'TOZO'A (Neo-Lat. nom. pl., from Gk. *ἐντός, entos,* within + *ζῷον, zōon,* animal), or ENDOPARASITES. Parasitic animals living within the tissues or organs of other animals. The term "entozoa" or "enterozoa" was formerly extensively used, especially for the internal parasites of man. In recent years the name has fallen into disuse, because it did not include a natural assemblage of forms, but animals of several different types. The opposite term is "ectozoa" or "epizoa"—the former designating parasites resident upon or within the skin, and the latter the same with more particular reference to crustaceous parasites of fishes. See PARASITE; FLATWORM; TAPEWORM; FLUKE; GUINEA WORM; ROUNDWORM; ETC.

ENTRECASTEAUX, äN'tr'-kä'stō', JOSEPH ANTOINE BRUNI, CHEVALIER D' (1739–93). A French navigator, born at Aix (Provence). He entered the navy at the age of 15 and three years later won the grade of ensign for valor displayed during the battle of Minorca (1756). In 1786 he became commander of the East India Station, and in 1787 he was appointed Governor of Mauritius and the Isle of Bourbon. He later explored New Caledonia (1791–92), where he was sent in search of the missing expedition of La Pérouse, and discovered several groups of islands. He died at sea, off the north coast of New Guinea, July 20, 1793. His name is perpetuated in the Entrecasteaux Archipelago; Entrecasteaux Point, on the southwestern coast of Australia; and in Entrecasteaux Channel, between Tasmania and Bruni Island. Consult *Voyage d'Entrecasteaux à la recherche de La Pérouse* (1808), and also Hulot's *D'Entrecasteaux* (Paris, 1894).

ENTRE DOURO E MINHO, äN'tre dō̅ō'ī-ro ä mē'nyo ('between Douro and Minho'), or MINHO. A province of Portugal, bounded by Spain, from which it is separated by the Minho on the north, the Portuguese Province of Traz-os-Montes on the east, the river Douro on the south, and the Atlantic on the west (Map: Portugal, A 2). Area, 2808 square miles. The surface is broken and mountainous, with some snow-capped peaks in the eastern part. The numerous streams afford irrigation facilities, and the soil is well cultivated. For administrative purposes the province is divided into the three districts of Vianna do Castello, Braga, and Porto (Oporto). It is the most densely populated province of Portugal. Pop., 1890, 1,091,936; 1900, 1,170,361; 1911, 1,289,066.

ENTRE MINHO E DOURO. Form of name preferred by the Portuguese for ENTRE DOURO E MINHO (q.v.), or MINHO.

ENTREMONT, COMTE D'. See L'HOPITAL.

ENTRE RIOS, än'trä rē'ôs ('between rivers'). A province of Argentina, bounded by the Province of Corrientes on the north, Uruguay River on the east, and the Paraná on the south and west (Map: America, S., H 4). Area, 28,792 square miles. The country is generally flat, well wooded, and well watered. Cattle raising and agriculture are the principal occupations of the inhabitants. The province is amply provided with transportation facilities through its railways and navigable waterways. The chief exports are animal products. Pop., 1892, 367,000; 1912 (official estimate), 429,348. Capital, Paraná.

EN'TRESOL, *Fr. pron.* äN'tr'-sōl' (Fr. *entre,* between + *sol,* ground). A low story between two main stories of a building (generally between the ground floor and the main story), or inserted in the upper portion of a high story, when certain rooms are of greater height than the others upon the same floor. It is sometimes called the *mezzanine* floor. See MEZZANINE.

ENTROCHITE. See BEADS, ST. CUTHBERT'S.

ENTRO'PION, or **ENTROPIUM** (Neo-Lat., from Gk. *ἐντροπία, entropia, ἐντροπή, entropē,* introversion, from *ἐν, en,* in + *τρέπειν, trepein,* to turn). Inversion of the margin of the eyelid, consequent either on loss of substance ("cicatricial entropion") or on spasmodic contraction of the orbicularis palpebrarum muscle which closes the eyelids ("spasmodic entropion"). The latter form occurs chiefly in old persons, in whom the skin of the eyelid is relaxed and the eyeball sunken. The symptoms are due to the irritation of the cornea by the eyelashes, which are inverted and rub against it. (See TRICHIASIS.) Removal of the lashes may relieve temporarily, but unless the cause can be removed operation is necessary.

ENTROPY. See ENERGETICS; THERMODYNAMICS.

ENTRY. The entrance into a mine. The term usually refers to a level or sloping entrance into a coal mine and is rarely used in connection with metal mines.

ENTRY, RIGHT OF. In the common law, the right to consummate an inchoate or incomplete title to land by taking possession thereof. This right is in legal theory coextensive with the right of possession, but it carries with it the implication that such possession is wrongfully withheld or, at least, that it has not been transferred to and assumed by the person entitled.

The right arises under three sets of circumstances: (*a*) Where an estate has passed by descent, or a lease for years has been made to a person not in possession. In such case the common law requires the heir or the lessee to enter upon the land in order to invest himself completely with the estate to which he has thus become entitled. (*b*) When lands are unlawfully withheld under a claim of freehold, from a person entitled thereto, as by a disseisin or adverse possession. The rightful owner may at common law, by an actual reëntry upon the lands, restore his title and thus prevent the adverse possession from ripening into a complete title. (*c*) Where lands have been conveyed upon a condition and the condition has been broken. Here the estate remains unaffected until the grantor or his heir exercises his right of entry, whereupon the estate of the grantee is ipso facto determined and the grantor "is in of his old estate."

The peculiar nature of the right of entry as a legal right appears from this enumeration of cases to which it is applicable. Though having to do with real estate, it is not itself an estate or interest in lands, nor, indeed, any species of property whatsoever, either corporeal or incorporeal; and though it will usually descend to the heir of the person entitled to it, it is in most cases incapable of assignment or transfer either by deed or will. On the other hand, it is not a mere right of action, which could not, by any magic, be transmuted, like the right of entry, into a substantial estate.

Originally a right of entry might be exercised by force, if necessary, but by an early English statute (5 Rich. II, st. 1, c. 8) it was provided that this remedy must be pursued "in a peaceable and easy manner, and not with force, or strong hand"; and since that date an entry, if opposed, can be made only by legal process. (See Forcible Entry.) The usual method provided is a summary proceeding instituted by writ of entry, under which, if it be defended, the right to the possession of the property in dispute can be tried and legally determined. In some of the United States this procedure must be followed in every case, even where the entry of the claimant is not disputed, but in others the common-law remedy is still available where the entry can be made without force. A right of entry is extinguished by an open and notorious possession of the premises for the period prescribed by the Statute of Limitations, which in the United States is usually 20 years. See Adverse Possession; Condition; Descent Cast; Disseisin; Limitation.

ENTRY, Writ of. An ancient form of action at common law for the recovery of the possession of land wrongfully withheld from the claimant. It belonged to the class of possessory, as distinguished from droitural, remedies, in the latter of which the right (*droit*) or title to the land was tried, and in the former the mere right of possession. But the feudal origin and character of our land law made title or ownership of real property depend in most instances on the possession of the land, and accordingly the possessory remedies came gradually to supersede those which were based upon a direct and exclusive assertion of ownership. There were many of these possessory remedies appropriate to various circumstances (of which the assize of *novel disseisin* and the assize of *mort d'ancestor* were in most general use); but the one which was available in all cases of wrongful ouster or dispossession, whether otherwise provided for or not, was the writ of entry. The efficacy of this proceeding was due to the fact that it gave effect to the right of entry, by the exercise of which one who was entitled to a freehold estate was enabled by the mere act of taking possession to reinvest himself with his rights therein. (See Entry, Right of.) In the course of time the proceeding by writ of entry became as intricate and complicated as the earlier remedies which it had displaced, and it was gradually abandoned in favor of the more summary action of ejectment. (See Ejectment.) After having long fallen into disuse, the writ of entry was, along with the other ancient possessory remedies, abolished by Act of Parliament, in 3 and 4 Will. IV, c. 27, § 36. It survives in several of the United States, however, in a simplified form, and usually for special purposes only—as, in some of the New England States, as a means of enforcing a mortgage. See Assize; Foreclosure; Seisin. Consult the authorities referred to under Real Property.

ENTWISLE, Joseph (1767–1841). An English Wesleyan Methodist clergyman, born in Manchester. In 1787, at the call of John Wesley, he entered the ministry; in 1812 he was elected president of the conference, and from 1834 to 1838 he served as governor of the Wesleyan Theological Institution. He wrote *Memoirs of Rev. J. Pawson* (1809) and *An Essay on Secret Prayer as the Duty and Privilege of Christians* (11th ed., 1861). Consult the *Memoir* by his son (Bristol, 1848; 4 later eds.).

ENTWISTLE, ĕnt'wis'l, James (1837–1910). An American naval officer, born at Paterson, N. J. He entered the engineer service of the navy in 1861, was in the Western Gulf squadron in the Civil War, was commissioned lieutenant commander in 1873, was promoted to be commander in 1888, served as inspector in different dockyards for construction of warships, joined the Asiatic squadron in 1895, and distinguished himself in the battle of Manila Bay, May 1, 1898. In 1899 he became captain and rear admiral and was retired.

ENURESIS. See Urine, Incontinence of.

EN'VELOPE (OF. *envoluper*, *enveloper*, *envelopper*, Fr. *envelopper*, to enwrap). A paper covering extensively employed for inclosing letters, circulars, pamphlets, and other mail matter, and for an endless variety of other purposes. Envelopes began to be used in England and the United States in the decade from 1840 to 1850. In both countries their use for letter mail followed the introduction of cheap postage. At first the blank forms from which envelopes are made were cut by hand to a pattern and also gummed and folded by hand. The first practicable machine for making envelopes was patented in England in 1844 by Warren De la Rue and Edwin Hill. In America the first patent was granted in 1849 to J. K. Park and C. S. Watson. The De la Rue machine was in many respects similar to the machines now in use, as described below; but instead of gumming and lifting the blank in practically one operation the blank was lifted by India-rubber fingers, then gummed by a separate arm.

Envelopes are now made entirely by machinery, and their manufacture is a comparatively simple process, involving one continuous operation. They are cut out directly from a ream of paper, 500 at a time, or in larger numbers if the paper is thin. This is accomplished by a steam-driven die. (See DIES AND DIE SINKING.) The blanks, thus cut, are automatically fed into the machine, where they are gummed, one by one, by the gum picker, which is fed with gum by means of rollers and applied to the margin of each blank. The blank is next carried on to the folding box, where folders press down the four flaps, but do not fasten down the upper one. The envelope is now carried on by an endless chain, and during its transit the loose flapper is dried. The finished envelopes are deposited in bunches of 25 by the endless chain, and, after being banded with a narrow strip of paper, are ready for shipment. By this process from 5000 to 6000 envelopes per hour can be made by a single machine.

During the closing years of the nineteenth century there was a remarkable development of labor-saving devices for office use. Among these inventions are various improvements on the ordinary gummed envelope. In the so-called "window envelope" the paper is either made transparent by wax or oil so as to render visible the address on the letter inclosed or an opening of appropriate size is covered by transparent paper with the same end in view. The position of the address on the letter as well as the size of the sheet and the manner of folding are so regulated as to bring it behind the opening, thus obviating the necessity for addressing the envelope, a time-consuming occupation. In another form of envelope a wire or thread is so attached to the inner edge of the envelope that by pulling it at either end the envelope is neatly torn open without the use of a knife. Then there are various devices for fastening together envelopes which are intended for inclosing second-class or unsealed mail or simply for filing purposes. Among these patented devices are numerous clasp fasteners, like those in which a thin narrow strip of flexible metal is attached to the body of the envelope and, for fastening, passes through an eyelet in the flap and is bent over; or those in which a cord attached to one eyelet is wound around a second eyelet; or others where a paper tongue passes through a slit in a flap. An envelope for mailing third-class matter, like circular letters, so as to have the appearance of first-class mail, is made by leaving ungummed a portion of the flaps, so the contents may be inspected. Expansive envelopes for filing purposes are made with fluted ends that fold over each other, so the envelope occupies but little space until it becomes well filled. At the end of 1909 there were 78 envelope manufacturing establishments, employing 5303 operatives. The value of their output was $13,453,522.

ENVELOPES. See CURVE.

ENVER PASHA. Turkish War Minister. For biography see SUPPLEMENT:

ENVOI, ăɴ'vwȧ', or **ENVOY,** ĕn'voi. The concluding stanza of a ballade or of other conventional verse forms. See BALLADE.

ENVOY (OF. *envoy*, Fr. *envoi*, message, from *envoyer*, It. *inviare*, to send, from Lat. *in*, in + *via*, way; connected with Lat. *vehere*, to carry, Gk. ἔχειν, *echein*, to have, Skt. *vah*, Av. *vaz*, to carry, Goth. *wigs*, OHG. *wec*, Ger. *Weg*, AS. *weg*, Eng. *way*). In international law, a diplomatic agent of the second order, next in rank to an ambassador. An envoy stands to his sovereign just as an agent does to his principal, and his acts or promises are the sovereign's in a business sense, though not in a personal sense. It is said that this class of diplomatists was first introduced by Louis XI of France in the second half of the fifteenth century. The envoy is superior in rank to the chargé d'affaires, whose credentials proceed from a minister of the state from which he is sent and are addressed to the minister of the state to which he is sent, or are a mere delegation from an ambassador or envoy to conduct the affairs of the mission in his absence. The practice of the United States has interjected between the ambassador and the envoy a second class, called envoys extraordinary and ministers plenipotentiary, which, of course, throws the ordinary envoy into the third class. See AMBASSADOR; CHARGÉ D'AFFAIRES; CONSUL; DIPLOMATIC AGENT; EMBASSY; MINISTER.

ENZINA, ĕn-thē̆'nȧ, JUAN DEL. See ENCINA.

ENZINAS, ĕn-thē̆'nȧs, FRANCISCO DE, also called DRYANDER (1520–53). Author of a Spanish translation of the New Testament. He was born at Burgos, studied in Louvain (1539–41), and then in Wittenberg, where he lodged in Melanchthon's house. Here he translated the New Testament from the Greek and presented a copy (printed at Antwerp, 1543) to Charles V. He was imprisoned in Brussels for his heretical views. After a little more than a year he escaped and returned to Wittenberg. Next to the translation of the New Testament, his most important work is a *History of the State of the Netherlands and of the Religion of Spain*, published first in Latin, and then reprinted in French by François Duchesne (Geneva, 1558), and again republished by Campan under the title *Mémoires de Francesco de Enzinas* (*Dryander*) (3 vols., Brussels, 1862–63). Consult title Menéndez y Pelayo, *Historia de los Heterodoxos españoles*. In 1548 he was made professor of Greek at Cambridge by Cranmer. Accounts of his death vary, some claiming that he died of the pest at Strassburg in 1553, and others claiming that we lose track of him at Geneva in 1570. His brother, Jaime, was burned as a heretic in Rome in 1546.

EN'ZIO (c.1225–72). A king of Sardinia, a natural son of the German Emperor Frederick II. He fought by his father's side against the Lombards at the battle of Cortenuova, in 1237, and in the following year was married to Adelasia, widow of Ubaldo Visconti, and given the title of King of Torres and Gallura and later that of King of Sardinia. In 1241, the command of the fleet having been intrusted to Enzio, he gained a splendid victory over the Genoese and captured 100 prelates on their way to a council at Rome. Enzio was afterward sent into Lombardy, which was for several years the scene of his chief exploits. In 1248 he besieged Parma, but was forced to retire. He then besieged Colonna, and in 1249 took the castle of Arola, but on May 26 of the same year he was taken prisoner at Fossalta by the troops of Bologna and consigned to perpetual imprisonment. His capture was a great blow to the cause of the Hohenstaufen. Enzio died March 14, 1272. His great talents as a warrior and poet, his sad lot, his beauty, and the fate of his family have received much sympathetic treatment in history and literature. Consult Blasius, *König Enzio* (Breslau, 1884), and Jordan, *Les origines* *de la domination angevine en Italie* (Paris, 1909).

ENZOÖTIC, ĕn-zṓ-ŏt′ĭk (Gk. *ἐν*, *en*, in + *ζῷον*, *zōon*, animal). A disease which seems to be permanently established among the animals of a certain locality. The term corresponds to "endemic disease" in mankind.

EN′ZYME (MGk. *ἔνζυμος*, *enzymos*, leavened, from Gk. *ἐν*, *en*, in + *ζύμη*, *zymē*, leaven). A name applied to any one of a certain group of thermolabile catalytic agents that occur in plants and in animals, and have the power of hastening the transformation of various compounds when brought into contact with them. They were formerly called unorganized ferments, to distinguish them from yeasts and bacteria (organized ferments), which produce similar changes. The distinction has no value; for it has been shown that the action of the so-called organized ferments is often due to enzymes produced by them. Little is known of the chemistry of the enzymes; indeed, there is no available test of their presence except their action, and no way of establishing their purity. When prepared by any of the usual methods, they are certainly mixed with other substances. Some investigators maintain their protein nature, others hold that they are nonprotein, while still others would even place them among the nucleoproteins.

Enzymes are produced in all kinds of plants. They may generally be obtained by crushing or grinding the plant tissue, extracting it for 24 hours with several volumes of an appropriate solvent (water, salt solution, glycerin, weak alcohol, etc.), filtering and precipitating by the addition of an excess of alcohol or of a neutral salt. The substances thus obtained may be somewhat purified by washing, redissolving, and subjecting to a process of dialysis. The plant cell has been spoken of as an arsenal of enzymes. Six have been identified in the cells of ripe banana, 11 in *Penicellium camemberti*, and 14 in other molds. These probably represent only a fraction of the enzymes actually existing in these cells.

The action of enzymes is probably a chemical one, the enzyme itself being so slowly decomposed in the process (if it is affected at all) that it practically acts by its mere presence. The action differs according to the enzyme and the substance affected. Often it is one of hydrolysis; i.e., the substance acted upon takes up the elements of water and is at the same time split up chemically. One class of enzymes, however, causes oxidation, and two enzymes are known which split up compounds without introducing other atoms into their molecules. The following are examples of these changes:

1. An hydrolysis effected by the enzyme invertase:

$$\underset{\text{Cane Sugar}}{C_{12}H_{22}O_{11}} + \underset{\text{Water}}{H_2O} = \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

2. An oxidation effected by the enzyme lactase:

$$\underset{\text{Hydroquinone}}{2C_6H_4(OH)_2} + O_2 = \underset{\text{Water}}{2H_2O} + \underset{\text{Quinone}}{2C_6H_4O_2}$$

3. A decomposition effected by the enzyme myrosin:

$$\underset{\text{Sinigrin}}{C_{10}H_{18}NKS_2O} = \underset{\substack{\text{Allyl sulpho-}\\\text{cyanate}}}{C_3H_5CNS} + \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\substack{\text{Acid}\\\text{potassium}\\\text{sulphate}}}{KHSO_4}$$

Various other types of reactions are produced by enzymes. Catalase, of universal distribution in living cells, splits hydrogen peroxide into water and oxygen. Mutase, probably of general distribution in plants and animals, transforms two molecules of an aldehyde into a molecule each of the corresponding alcohol and acid.

The rate of activity of enzymes is greatly modified by temperature, which shows two main effects. First, the rate is increased as the temperature rises, and this in a very regular way, 1.6 to 2.2 fold per 10° C. rise of temperature, beginning at 0° C. or a little above. The second effect is the destruction or the coagulation of the enzyme, and it becomes evident at 40° C. or above, and rises rapidly as the temperature rises, giving almost instantaneous destruction at 70° C.–80° C. for the various enzymes. As a result of the two effects, there appears what has been called the optimum temperature for enzymic action. It is not a fixed point, but varies with the duration of the experiment, being lower the longer the duration, for in longer duration the destruction effect is more manifest. Colloidal metals, or hydrosols of metals, as catalyzers, show a similar optimum, so this is not a distinct feature of enzymes. Enzymes are indifferent to the action of diffuse daylight, but are very readily destroyed by direct sunlight. It has been shown that the invisible ultra-violet rays cause more than 99 per cent of this destruction.

Many substances are marked depressors of enzyme activity or actual destroyers of the enzymes. Among these may be mentioned mercuric chloride, hydrogen sulphide, hydrocyanic acid, formaldehyde, phenol, and excesses of acids or bases. Some of these have a very similar effect on the catalytic action of colloidal metals. Most reagents are far less destructive to enzymes than they are to the living cell. This is especially true of chloroform, toluol, thymol, and others; consequently, by the addition of one of these, the growth of organisms in a digesting mixture can be prevented without seriously interfering with the action of the enzyme. Formaldehyde is said to be about equally destructive to protoplasm and to enzymes. Both the plant and animal body produce thermolabile substances that are capable of stopping or greatly reducing the activity of enzymes. These have been termed antienzymes. Many substances greatly accelerate the activity of enzymes or are even necessary to permit any activity. This is true of traces of acids for most plant enzymes, sodium fluorid for cystase, various salts for diastase, manganese salts for oxydases, and coenzyme for zymase. It is probably hard to overestimate the physiological significance of these accelerators and depressors of enzyme activity for the organism. It is probable that these in large part determine the rate at which the processes occur in the organism. They bring out of the arsenal of enzymes in the cells regulating activity that leads to the normal development of the organism.

The marked similarity between enzymes and colloidal metals as catalysts is well known. This is a result of the colloidal nature of water solutions of enzymes, a fact that has been established by evidence from many directions.

The origin of those enzymes which have been investigated seems to be indirect, substances called zymogens being produced by the active cells. The zymogens appear as minute granules in the protoplasm which is about to form enzymes, and under appropriate conditions are transformed into enzymes, disappearing as the enzymes increase.

A few of the better-known enzymes, their distribution, the substances they attack, and the chief products of their action are shown by the following table:

ENZYME	Occurrence	Substances attacked	Product of the action
Diastase[1]	All plants	Starch	Maltose, Dextrin.
Inulase	Compositæ, etc.	Inulin	Fructose.
Cytase	Many plants	Cellulose	Sugars (?)
Invertase	Many plants	Saccharose	Glucose, Fructose.
Maltase	Many plants	Maltose	Glucose.
Zymase[1]	Yeasts	Sugars	Alcohol, Carbon dioxide.
Lactase	Kephir	Lactose	Glucose, Galactose.
Trehalase	Several fungi	Trehalose	Glucose.
Raffinase	Molds, yeasts	Raffinose	Glucose, Fructose, Galactose.
Melizitase	Molds	Melizitose	Glucose, Touranose.
Emulsin	Rosaceæ, Euphorbiaceæ, Fungi	Various glucosides	Glucose, Various subs.
Myrosin	Cruciferæ	Sinigrin	Glucose (see above).
Erythrozyme	Madder plant	Rubian	Glucose, Red pigment.
Rhamnase	Rhamnus infectorius	Xanthorhamnin	Glucose, Rhamnin.
Gaultherase	Wintergreen, etc.	Gaultherin	Glucose, Wintergreen oil.
Papain	Carica papaya	Proteids	Proteoses, Peptones, etc.
Bromelin	Pineapple	Proteids	Proteoses, Peptones, Amides.
Trypsin[1]	Germinating seeds Carnivorous plants	Proteids	Peptones, Amino-acids.
Lipase	Oily seeds	Fats	Glycerin, Fatty acids.
Rennet	Various plants	Casein (?)	Coagulates milk.
Pectinase	Acid fruits and various leaves	Pectin, etc.	Pectic acid. Forms jelly.
Laccase	Lac plants, etc.	Laccol	Oxidizes it.
Tyrosinase	Russula, beet, dahlia	Tyrosin	Oxidizes it.
Alcoholase	Acetic acid organism	Ethyl alcohol	Acetic acid.
Lactolase	Lactic " "	Glucose	Lactic acid.
Catalase	Universal	H_2O_2	H_2O and O_2.
Mutase	General	Aldehydes	Alcohol and acid.

The enzymes whose names are italicized in the above table are described in special articles in this encyclopædia.

EOANTHROPUS DAWSONI. See MAN, ANCIENT TYPES.

E'OBA'NUS, HELIUS, also called HESSUS (1488–1540). A German humanist. His name properly was Eoban Koch. He was born in Hesse, probably at Halgehausen. He led the wandering life of so many scholars of that period, teaching, lecturing, and writing in different places. He identified himself with the Reformation and showed his humanistic sympathies by participating in the famous *Epistolæ Obscurorum Virorum*, and his scholarship and poetical ability in his translations of Ecclesiastes (1532) and the Psalms (Marburg, 1537), whence his epithet "the Hessian David." For his life, consult Krause (Gotha, 1879).

E'OCENE EPOCH (from Gk. ἠώς, *ēōs*, dawn + καινός, *kainos*, new). A division of geologic time following the Cretaceous period and marking the beginning of the Cenozoic era. At the end of the Cretaceous period great geographical changes occurred in both Europe and North America, by which the floor of the inland seas was raised partly into land and partly into shallow waters. This elevation took place slowly and occupied a long interval of time, so that when the Eocene period opened the fauna and flora had assumed a decidedly modern aspect. Among invertebrates the ammonites, which were characteristic of the Mesozoic era, declined in importances, while bivalves, such as the oyster, clam, and scallop, common at the present day were very numerous. Ganoid fishes became subordinate to the teleosts, which included perch, herring, and sharks, and mammals predominated over reptiles. In rocks of this period have been found the remains of *Hyracotherium*, the earliest-known ancestor of the horse. The vegetation included dicotyls, palms, and grasses belonging to genera living at the present time. Eocene rocks in the United States are found along a belt that extends parallel to the Atlantic coast from New Jersey to Florida, where they overlie the Cretaceous unconformably and dip slightly towards the sea, disappearing beneath younger beds. They also occur in the Mississippi valley, in the Gulf States, and in California, Oregon, and Washington. There are numerous basins also in the Rocky Mountain region of Utah, Wyoming, Colorado, North Dakota, and New Mexico, which, unlike the preceding, were deposited in fresh water. The most important of these basins are the Puerco, Wasatch, Green River, and Uinta. In the Uinta basin the deposits are 6000 to 8000 feet thick. The following division of the Eocene is recognized by American geologists: Atlantic and Gulf States:

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[1] The total effect is probably due to the action of two enzymes. Diastase consists of amylase, which hydrolizes starch to dextrin, and dextrinase, which hydrolizes dextrin to maltose. Zymase consists of zymose, which transforms the sugar to lactic acid, and lactisidase, which transforms lactic acid to alcohol. Trypsin consists of protease, giving peptones, and ereptase, producing amino acids.

(*a*) Midway, (*b*) Lignitic, (*c*) Lower Claiborne, (*d*) Claiborne, (*e*) Jackson, (*f*) Vicksburg; Western States: (*a*) Fort Union, (*b*) Wasatch, (*c*) Wind River, (*d*) Bridger, (*e*) Uinta. The rocks of the Eocene include clays, sands, limestones, and sandstones, while among the economic minerals are marls in the Atlantic States, phosphate rock in Florida, petroleum in California, and brown coal in Washington. Consult "Correlative Papers—Eocene," *United States Geological Survey Bulletin, No. 83* (Washington, 1891); Report on "Eocene," *Maryland Geological Survey Publications* (Baltimore, 1901); Chamberlin and Salisbury, *Geology*, vol. iii (New York, 1907). See TERTIARY SYSTEM; GEOLOGY.

E'OHIP'PUS. See HYRACOTHERIUM; and HORSE, FOSSIL.

EOLIAN HARP. See ÆOLIAN HARP.

EOLIAN ROCKS. See ÆOLIAN ACCUMULATIONS.

EOLIANS. See ÆOLIANS.

EOL'IPILE. See ÆOLIPILE.

EOLITHIC. See PALEOLITHIC PERIOD.

EON. See ÆON.

ÉON, ā'ôɴ', CHARLES DE BEAUMONT D' (1728–1810). A French diplomatist, commonly known as the Chevalier d'Éon, who owes his celebrity to doubts as to his sex. He was born at Tonnerre, Burgundy, and practiced as an advocate in Paris. He published in 1753 some important works on history and political economy which attracted the attention of Louis XV, who sent him in 1755 on a diplomatic mission to Russia, where he assumed the dress of a woman, gained the favor of the Empress Elizabeth, and negotiated an advantageous treaty. After serving with the French army in Germany in 1759, he was made Minister Plenipotentiary to London (1763), and stood so high in favor with the King as to incur the jealousy of Madame de Pompadour, who brought about his dismissal. He was granted a large pension by the King in return for keeping diplomatic secrets and took up literary work. On his return to France (1777) the government, for reasons which have never been made known, required him to assume the female dress, which he wore for the remainder of his life. This fact gave rise to doubts as to his sex, which were not settled until his death. On the outbreak of the French Revolution he offered his services to the French nation, but they were declined, and he passed the rest of his days in poverty in England. The Chevalier d'Éon was the author of many historical and political essays which were published under the title of *Loisirs du Chevalier d'Eon* (Amsterdam, 1775). The *Mémoires* attributed to him and edited by Gaillardet (Paris, 1836) are not genuine. Consult: Telfer, *The Strange Career of the Chevalier d'Eon de Beaumont* (London, 1885); Hoff, *Merkwürdiges Leben des ehemaligen Ritters von Eon* (Leipzig, 1870); Madame Campan, *Mémoires*; Bachaumont, *Mémoires*; La Fortelle, *Vie militaire, politique et privée de demoiselle C.G.L.A.A.T. Eon ou d'Eon* (Paris, 1779).

EON, or **EU'DO DE STEL'LA**, or **ÉON DE L'ÉTOILE**, ā'ôɴ' de lā'twäl'. A religious fanatic of noble birth, who lived in Brittany in the twelfth century and claimed to be the final judge of mankind. He is said to have applied to himself the pronoun *eum*, in the familiar liturgical formula, *per eum qui venturus est iudicare vivos et mortuos*, 'through Him who will come to judge the quick and the dead,' whence his name, *Eon*. He opposed the hierarchy of the church, although he did not hesitate to construct a new one of his own, ordaining his followers as bishops and archbishops. His enthusiastic adherents went forth to plunder and destroy churches and monasteries. In Eon himself miraculous powers were believed to reside. He was publicly opposed at Nantes by the Cardinal Legate, Alberic, and Hugo, Archbishop of Rouen, wrote a book against him, *Dogmatum Christianæ Fidei*. In 1148 he was seized, along with some of his leading adherents, and brought before a synod at Rheims for trial. He was adjudged insane and thus escaped execution, but he was imprisoned for the rest of his life, and some of his followers were burned at the stake. His sect soon died out. There is little ground for the commonly accepted opinion that Eon belonged to the Cathari. Consult H. C. Lea, *History of the Inquisition of the Middle Ages*, vol. i (New York, 1888), and Döllinger, *Beiträge zur Sektengeschichte des Mittelalters*, vol. i (Munich, 1890).

EOS. See AURORA.

EOSCORPIUS, ē'ō-skôr'pĭ-ŭs (Neo-Lat., from Gk. *ἠώς*, *ēōs*, dawn + *σκορπίος*, *skorpios*, scorpion). A fossil scorpion which is characterized by a slender form, parallel sides of the carapace, and slender hand and pincers. Four separate species have been found in the Carboniferous fossil locality at Mazon Creek, Ill., celebrated for its nodules with plant and animal remains. See SCORPION.

EOSIN. See COAL-TAR COLORS.

EOS'TRA. The Teutonic goddess of Spring, the name of whose festival, it is supposed, has been transferred to the Christian Easter (q.v.).

EÖTVÖS, ĕt'vĕsh, JÓZSEF, BARON (1813–71). A distinguished Hungarian statesman and author, who has left a lasting imprint upon both the literary and political life of his country. He was born at Buda, studied philosophy and jurisprudence at the University of that city, and when barely 20 entered upon an official career as vice notary at Pressburg, but soon abandoned it in favor of literary pursuits. He had already attracted some attention through a translation of Goethe's *Götz von Berlichingen* (1830), two comedies, *Kritikusok* (The Critics) and *Házasulók* (The Matrimonially Inclined), and a tragedy, *Boszú* (Revenge). After an extended tour through Germany, France, England, Switzerland, and the Netherlands, he returned to his father's estate and there devoted himself to writing his famous novel *Karthausi* (The Carthusian), which was at once hailed with delight by the public and critics alike (1842). About this time Eötvös began to be prominent in politics. When the Liberal party became divided, in 1844, into Municipalists and Centralists, he became, as member of the House of Magnates, one of the most earnest supporters of the latter party, and a frequent contributor to Kossuth's organ, the *Pesti Hirlap*, his stirring articles being later collected in a volume under the title *Reform* (Leipzig, 1846). Quite in line with his active interesting public reforms is the theme of his second romance, *A Falu Jegyzője* (The Village Notary), in which he painted the abuses growing out of the old system of public administration in Hungary, based upon county elections, and which enjoyed no less vogue than his earlier novel. It has been translated into German by Mailáth, and into English by Otto

Wenckstern (1850). It was followed, in 1847–48, by his *Magyarország 1514-ben* (Hungary in 1514), an historical romance.

Upon the formation of the national Hungarian ministry, after the revolution of March 15, 1848, Eötvös was appointed Minister of Public Instruction, but after the stormy scenes of the following September resigned his office and retired to Munich, where he lived for three years, and where his literary labors bore important fruit in the form of a philosophical work, in German and Hungarian, upon *The Influence of the Ideas of the Nineteenth Century upon State and Society* (1851–54). He returned to Hungary in 1851, was made vice president of the Hungarian Academy in 1855 and president in 1866. In 1861 he reëntered political life, founded in 1865 the *Political Weekly* (*Politikai Hetilap*), and in 1867 became once more Minister of Public Instruction, an office which he filled until his death and which gave him the opportunity of introducing salutary reforms. His works were published in 1870 in 14 vols. and a new edition was undertaken in 1891. Consult: Schwicker, *Geschichte der ungarischen Litteratur* (Leipzig, 1889); Kont, *Geschichte der ungarischen Litteratur* (ib., 1906); in Hungarian, the life by Z. Ferencsi (1903).

EÖTVÖS, Roland, Baron (1848–). An Hungarian scientist and statesman, born at Budapest. He obtained his scientific training at the universities of Königsberg and Heidelberg and was appointed a lecturer at Budapest in 1871 and in 1873 professor of experimental physics there. In 1873 he became connected with the Hungarian Academy of Sciences, of which he was elected president in 1889. His investigations respecting gravitation and capillary attraction were described by him in various learned journals and made him well known in scientific circles. He also became a life member of the Hungarian House of Magnates and in 1895–96 held the difficult post of Minister of Public Worship and Education.

E'OZO'ÖN (Neo-Lat., from *ἠώς*, *ēōs*, dawn + *ζῷον*, *zōon*, animal). A supposed fossil organism found in the crystalline metamorphic limestones of the Archean Laurentian series of the lower St. Lawrence valley. Eozoön occurs mostly in the form of concentric layers of the mineral serpentine, constituting concretionary masses in the limestone and approximating in structure some of the hydroid corals, such as Stromatopora. It was originally described by Sir J. W. Dawson, as a gigantic foraminiferan, and several papers in support of his contentions regarding the object were published by him. Other similar objects were afterward found in rocks of equivalent age in Bavaria. The researches of Möbius and others have tended to disprove the organic nature of Eozoön, and it is now generally considered to be nothing more than a mineral concretion or segregation.

E'PACT (Gk. *ἐπακτός*, *epaktos*, added, intercalated, from *ἐπάγειν*, *epagein*, to add, from *ἐπί*, *epi*, upon + *ἄγειν*, *agein*, to lead). A number varying for each year, employed in the ecclesiastical calendar for fixing the dates of the ecclesiastical new moons. These dates differ sometimes as much as three days from those of the actual or "astronomical" new moons.

Briefly stated, the epact for any year may be defined as the number of days elapsed at the beginning of the year since the preceding new moon. The epact once known, it is therefore easy to calculate the dates of all the following lunar phases throughout the year.

To calculate the epact for any year, it is first necessary to know the "golden number" (q.v.). This is found by the following rule: Add 1 to the date of the year, and divide by 19; the remainder is the golden number; when the remainder is 0, the golden number is 19. Knowing the golden number, the epact can then be taken from the following table. For instance, when the golden number is 13, the epact is 12 for years from 1700 to 1899, and 11 for the years between 1900 and 2199:

TABLE OF EPACTS

GOLDEN NUMBER	1700 to 1899	1900 to 2199	GOLDEN NUMBER	1700 to 1899	1900 to 2199
1.......	30	29	11......	20	19
2.......	11	10	12......	1	30
3.......	22	21	13......	12	11
4.......	3	2	14......	23	22
5.......	14	13	15......	4	3
6.......	25	24	16......	15	14
7.......	6	5	17......	26	25
8.......	17	16	18......	7	6
9.......	28	27	19......	18	17
10.......	9	8			

EPAM'INON'DAS (Lat., from Gk. *'Επαμεινώνδας*, or *'Επαμινώνδας*) (c.418–362 B.C.). A Greek statesman and general. He was born at Thebes, of an influential though not wealthy family. He spent his early life in study as a pupil of the Pythagorean philosopher Lysis of Tarentum, who, exiled from home, lived with the father of Epaminondas. When the Theban democracy was established, he came forward as one of its strongest supporters. He was a member of the deputation sent by Thebes to the congress of Grecian states held at Sparta in 371 B.C. and spoke on that occasion in defense of the Theban policy of maintaining a united Bœotia. War was, in consequence, straightway declared by Sparta. Epaminondas was appointed commander in chief of the Theban army, which consisted of about 6000 men. The Spartans, though they had a much larger force, were defeated at Leuctra in the early part of July, 371 B.C.; the victory was due mainly to Epaminondas' skillful handling of the hoplites, or heavy infantry. (See Phalanx.) The supremacy of Sparta was now at an end. In 370 B.C. Epaminondas and Pelopidas invaded the Peloponnesus and attacked Sparta, which successfully defended itself under the lead of Agesilaus (q.v.). Epaminondas, however, restored Messenia to its former position as an independent state (369 B.C.); under his auspices, too, Megalopolis was founded as the centre of the Arcadian Confederacy. In 368 B.C. Epaminondas made a second expedition into the Peloponnesus and in 366 a third. In 362 he undertook a fourth expedition, having this time a coalition of Sparta and a number of states opposed to him. He fought a great battle at Mantinea (q.v.), in which the Thebans were successful, but Epaminondas himself fell. Epaminondas was one of the purest and noblest characters in Grecian history. His life was written by Cornelius Nepos. Consult: the life by Cornelius Nepos (q.v.); Du Mesnil, "Ueber den Werth der Politik des Epaminondas," in *Historische Zeitschrift* (Berlin, 1863); Pomtow, *Das Leben des Epaminondas* (Berlin, 1870); Pöhlman, *Grundriss der griechischen Geschichte* (4th ed., Munich, 1914).

EP'ARCH (Gk. *ἔπαρχος*, *eparchos*, governor, from *ἐπί*, *epi*, upon, over + *ἀρχή*, *archē*, rule, from *ἄρχειν*, *archein*, to rule). In ancient Greece, the governor of a province, the commander of ships or of troops, etc. In Roman times the word was used in Greek provinces of Rome as the equivalent of *præfectus*. (See PREFECT.) The district governed by the eparch was called an *eparchy*. In modern Greece the eparchy is one of the parts of a nomarchy and is itself divided into demarchies. (See NOMARCHY.) In Russia the term has an ecclesiastical use and denotes the diocese or archdiocese of a bishop or archbishop of the Greek church.

EPAULEMENT, ĕ-pal'ment (Fr., from *épaule*, shoulder, from Lat. *spatula*, blade, shoulder). A part of siege or covering works in military fortification. Siege batteries are usually shielded by epaulements built so as to form an obtuse angle with the main line of the battery, protecting guns and gunners from flank fire. Practically an epaulement is any screen used for the protection of troops. See FORTIFICATION; SIEGE AND SIEGE WORKS.

EP'AULET (Fr. *épaulette*, dim. of *épaule*, shoulder). An ornamental shoulder badge of rank, formerly in very general use throughout the armies and navies of the world—a survival of the metal shoulder piece of mediæval days. Epaulets were worn by commissioned officers in the United States army as late as 1872, when they were replaced, in all uniforms save those of general officers, by shoulder knots. At the present time in the United States army epaulets are worn only by general officers in dismounted full-dress uniform. In the British army they were worn up to 1855 by all ranks, the officers' epaulets being of gold and those of the rank and file of worsted. Epaulets are worn generally in the navies of all nations by commissioned officers as a part of the full-dress uniform. They are usually of gold bullion and bear the significant marks of the officer's rank. See UNIFORMS, MILITARY AND NAVAL.

ÉPÉE, ā'pā', CHARLES MICHEL, ABBÉ DE L' (1712–89). One of the founders of the system of instruction for the deaf and dumb. He was born at Versailles, France, Nov. 25, 1712. He became a priest and canon at Troyes, but eventually, on account of his Jansenist opinions, was deprived of this appointment and went to live in retirement in Paris. About 1765 he began to occupy himself with the education of two deaf and dumb sisters, using a system of signs. His first attempt being crowned with success, he determined to devote his life to the subject. At his own expense he founded (1770) an institution for the deaf and dumb, but his favorite wish, the foundation of such an institution at the public cost, was not fulfilled till after his death, which took place Dec. 23, 1789. He wrote a work entitled *Institution des sourds et muets* (2 vols., Paris, 1774), which afterward appeared in an improved form, under the title *La véritable manière d'instruire les sourds et muets* (Paris, 1784).

EPEIRIDÆ, ĕp-ī'rĭ-dē (Neo-Lat. nom. pl., from Gk. *ἐπί*, *epi*, upon + *εἶρος*, *eiros*, wool; so called from their web). A family of spiders, the so-called orb weavers, which includes many of our commonest and most frequent spiders. See SPIDER.

EPEIROGENIC MOVEMENTS, ĕ-pī'rō-jĕn'ĭk. In geology the slow crustal uplifts or subsidences which involve large tracts of continental lands. As they are necessarily measured from sea level, they may mean an actual change in the oceanic basins rather than a movement of the land surface. They differ from mountain-making processes (orogenic movements) in that they are unaccompanied by folding of the strata, the evident result of lateral compressive strains. See ELEVATION; SUBSIDENCE.

EPERIES, ā-pā'rē-ĕs, Hung. **EPERJES**, ĕ'pĕr-yĕsh (ML. *Eperesinum*, Slav. *Preshov*). The capital and an episcopal city of the County of Sáros, in Hungary, situated on the left bank of the Tarcza, about 190 miles northeast of Budapest (Map: Hungary, G 2). In 1887 it was totally destroyed by fire except its ancient walls and fortifications, but it has been largely rebuilt. Among the chief public buildings are the Gothic church of St. Nicholas, the Franciscan abbey, the bishop's palace, military barracks, the county building, chapter house, town hall, and theatre. Eperies is the seat of a Greek Catholic bishop and of a Royal Court of Justice. Its educational institutions include a Lutheran college, a royal Catholic gymnasium, a girls' school, a seminary, and a library of over 30,000 volumes. There are manufactures of earthenware, linen cloth, and flannel, and a considerable trade in grain, wine, and cattle. In the vicinity are the royal salt works of Sóvár, the bathing resort, Czeméte, which belongs to Eperies, and the opal mines of Vörösvagas, 6 miles from Eperies and the only opal mines in Europe. From these mines was obtained one piece weighing 2940 carats, valued at about $750,000, and now preserved in the court museum at Vienna. Eperies was colonized by Germans in the thirteenth century and was made a royal free city in 1374. The inhabitants, who became Protestants in the sixteenth century, suffered bitter persecution, especially in the year 1687, when the Imperialist general Caraffa instituted the famous Bloody Tribunal for the trial of recusants. Eperies was celebrated for its schools in the sixteenth and seventeenth centuries. Pop., 1900, 14,447; 1910, 16,323.

ÉPERNAY, ā'pâr'nā'. The capital of an arrondissement in the Department of Marne, France, situated in the midst of the champagne district, on both banks of the Marne, 88 miles by rail from Paris (Map: Northern France, J 3). The chief part of the town on the left bank is well built, with many fine villas in the suburbs. It manufactures earthenware from a clay obtained near by and called *terre de Champagne;* also hosiery, refined sugar, hats, caps, and leather. The Eastern Railway maintains large workshops here. It has a brisk trade in bottles, corks, and wire, and is the chief centre of the champagne trade. Large storage cellars have been hollowed out of the chalk rock. Pop. (commune), 1901, 20,478; 1911, 21,811. Epernay is the ancient Sparnacum and the Roman Aquæ Perennes. Francis I burned it in 1544 to defeat the attempt of Charles V to obtain possession of its wine stores. In 1592, during the wars of the League, it was captured by Henry IV, Marshal Biron being killed during the attack.

ÉPERNON, āpâr'nôN', JEAN LOUIS DE NOGARET, DUC D' (1554–1642). A French courtier, originally called Caumont and La Valette. In 1573 he identified himself with the fortunes of Henry III, whose most influential favorite he became, and who bestowed upon him wealth and titles, including the newly created Duchy of Epernon (1581) and the admiralty of France. He was originally a defender of absolute monarchy, hostile towards any concession to the estates, and the foe most dreaded by the Catholic League. In 1587 he was appointed Governor of Normandy, but in 1588 the league persuaded the King to send him into exile at Loches. Despite this he remained faithful to the crown. In 1596 he was made Governor of Limousin by Henry IV, and in 1622 was transferred to Guienne. Meanwhile his political attitude had diametrically changed, and he had become the boldest exponent of the independence of the provincial noblesse. He opposed the concentration policy of Richelieu, by whom he was finally banished to Loches in 1641. In 1610 he had helped give the regency to Marie de' Medici. Consult the biography by Montbrison (Paris, 1874).

E′PHAH (Heb. *ĕphāh*, Copt. *ŏipi*, from Copt. *ĕpi*, to measure, *ŏpi*, to count). A dry measure of the ancient Hebrews. It contained 10 omers or three seahs—about four English pecks.

EPHAR′MONY (from Gk. ἐπί, *epi*, upon + ἁρμονία, *harmonia*, harmony, from ἁρμόζειν, *harmozein*, to fit). The state of the adapted plant, as manifested in the plant form. See Ecology.

EPHE′BUS (Lat., from Gk. ἔφηβος, from ἐπί, *epi*, upon + ἥβη, *hēbē*, youth, puberty). Among the ancient Greeks, a youth of the upper classes who has just attained manhood, which was commonly reckoned to commence at the sixteenth year. In Athenian constitutional law it denoted one who had attained his majority, but was not yet a full citizen, i.e., one who had begun his eighteenth, but had not attained his twentieth year. These ephebi entered upon their civic manhood by taking an oath of allegiance and devotion to the fatherland in the temple of Aglauros and for the next two years were trained in military exercises and employed in garrison and patrol duty. When this custom was introduced is not certain, but in a rudimentary form it is likely to have existed from the time of the Persian wars. In the latter part of the fourth century B.C., probably soon after the battle of Chæronea (338 B.C.), the institution was put on a firmer basis, which is described by Aristotle in his work on the Constitution of Athens (chap. xlii). At the head was a cosmētēs (κοσμητής), elected by the Assembly; the ephebi of each tribe were under the direct supervision of a sōphronistēs (σωφρονιστής), who was elected by the people from three men over 40 years of age, nominated by the fathers of the boys. The first year of the ephebus' training was given to instruction in gymnastics, the drill and weapons of heavy and light-armed infantry, and the management of the artillery engines. At the end of the year they received a shield, spear, and military cloak (see Chlamys) from the state and were assigned to garrison duty in Attica and police duty at the Assembly (see Ecclesia). After the fourth century the institution underwent many changes, which are reflected in the numerous inscriptions in praise of the ephebi and their officers, which may be found in the *Corpus Inscriptionum Atticarum* (vols. ii and iii). More and more the military side of the training sank into the background, and the compulsory character disappeared, so that it finally became a state system of education for the sons of the wealthy. Foreigners, too, were admitted. The ephebi had their own gymnasia, with baths and apparently libraries attached, and there was also a special gymnasium, the Diogeneion, for boys under 16 who were preparing to enter on the ephebic course. Full details of this interesting institution, which was imitated in other Greek states, can be found in Dumont, *L'Ephébie attique* (Paris, 1875); Girard, in Daremberg and Saglio, *Dictionnaire des antiquités* (Paris, 1892); Dittenberger, *De Ephebis Atticis* (Göttingen, 1863); Grasberger, *Erziehung und Unterricht im klassischen Altertum*, vol. iii (Würzburg, 1881); Girard, *L'Education athénienne au Ve et IVe siècle avant J. C.* (2d ed., Paris, 1891); Gilbert, *The Constitutional Antiquities of Sparta and Athens* (Eng. trans., London, 1895); Bryant, "Boyhood and Youth in the Days of Aristophanes," in *Harvard Studies*, vol. xviii, pp. 73–88 (1907); Walden, *The Universities of Ancient Greece* (New York, 1909).

EPH′EDRA. A genus of gymnosperms including about 30 species of low straggling shrubs, with long, jointed, and fluted green stems, and minute scalelike leaves forming a sheath at each joint. The whole habit of the plant is suggestive of a shrubby *Equisetum*. The species grow in the arid regions about the Mediterranean and also in tropical to temperate Asia, North America, and South America. The stamens and ovules are borne in cones that arise from the joints of the stem, some of the cones bearing only stamens and others only ovules. Each cone consists of broad, overlapping membranaceous bracts. In some species the fruit is decorative. Being somewhat susceptible to frost, the members of this genus are little grown except where they are not likely to suffer from cold. They succeed best upon dry, sandy, and rocky slopes, and are easily propagated by seed, suckers, or layers. For illustration, see Gymnosperms.

EPHEM′ERA (Neo-Lat., from Gk. ἐφήμερα, daily, from ἐπί, *epi*, upon + ἡμέρα, *hēmera*, day), or Febris Diaria. See Fever.

EPH′EMER′IDA (Neo-Lat., from Lat. *ephemeris*, Gk. ἐφημερίς, journal, from ἐφήμερος, *ephēmeros*, daily). An order of insects, allied to the dragon flies and noted for their very brief existence as adults; hence they are often called day flies. See May Fly.

EPHEM′ERIS (Lat., from Gk. ἐφημερίς, journal). A name applied to astronomical almanacs, containing data for each day. It is mostly confined to astronomical tables giving the daily places of the sun, moon, planets, and fixed stars, together with other phenomena of the heavens. The most important works of the kind at present are published under governmental supervision. They include the French *Connaissance des Temps*, the English *Nautical Almanac*, the Berlin *Astronomisches Jahrbuch*, and the *American Ephemeris and Nautical Almanac*. See Almanac.

EPH′ESI′ACA (Lat., from Gk. Ἐφησιακά, *Ephēsiaka*, relating to Ephesus, from Ἔφεσος, *Ephesos*, Ephesus), or Ephesian Tales. A Greek romance by Xenophon of Ephesus, relating the love story of Abrocomas and Anthia. In this tale is found the earliest source of the story of Romeo and Juliet.

EPHESIÆ LITTERÆ. See Ephesus.

EPHESIANS, ē-fē′zhanz, Epistle to the. One of the Epistles of the Apostle Paul. It is addressed, according to the common text, to the Christians at Ephesus, once the principal city of western Asia Minor. The question of its authorship, however, is debated, necessitating a careful study of the material which it presents. Assuming, as a working hypothesis for such study, the claim of Paulinity involved in the Epistle's address (i. 1), the following facts would seem to be clear: 1. A generality of tone involving a larger circle of readers than any one individual church. 2. The apparent lack of personal acquaintance on the part of the Apostle with the readers of the Epistle, which strongly militates against the theory of the common text that the Epistle was written to the church of Ephesus, a church founded by Paul and his friends (Acts xviii. 19 ff.) and built up by him on his third missionary journey, when he had his headquarters at Ephesus for over two years (52–55 A.D.; cf Acts xix). The additional fact that the Epistle contains no personal greetings or salutations also tells strongly against the theory that it was addressed to the church at Ephesus. 3. A striking resemblance in word and phrase to Colossians, leading to the inference of a contemporaneous date with that of this Epistle. 4. An evident imprisonment on the part of the Apostle (iii. 1), and an imprisonment which, in its freedom to preach and its opportunity for service (vi. 18–20), shows resemblance to the lenient conditions of his Roman imprisonment, narrated in Acts and referred to in the Epistles to the Colossians, Philippians, and Philemon. 5. The theme (the ideal unity of the Church in Jesus Christ supreme) appears to be a most natural development of the theme of Colossians (the exaltation of Jesus Christ as supreme), and a not unlikely outcome of the dominant thought of the Epistle to the Romans (the community between the Jewish and Gentile elements in the Church). These facts agree quite significantly with the Epistle's claim and render the assertion of its inconsistency with itself difficult of proof. Confirmation of these facts is further rendered by the strong witness borne to the Epistle as a product of the Apostle by external evidence from the time of Marcion (140 A.D.) down.

Over against all this there does not seem to be much force in the contention that the large element of catholicity in the Epistle would indicate a postapostolic date, since the catholicity which the Epistle presents becomes simply a consistent development of Paul's own ideas, reaching its climax in this encyclical message to the churches of a region which had been brought under the influence of his three years' work at Ephesus. It is of still less force to call attention to the peculiarities of word and phrase and general style in the Epistle, especially as these peculiarities find to a large extent their counterpart in the companion Epistle to the Colossians, which is admitted to be Paul's.

Accepting then the Pauline origin of the Epistle, it becomes a most interesting question how the title Ephesians came to be attached to it, in particular how "at Ephesus" came to be incorporated in the address (i. 1), there being no local Ephesian color in the Epistle and no salutations in it to members of the Ephesian church. The significance of this question is heightened by the fact that the documentary evidence is scarcely in favor of the phrase being part of the original text. The early and more important manuscripts omit it, while not a few of the early fathers show they did not read it in their copies of the letter. On the other hand, the assigning of this Epistle to Ephesus is continuous and universal in the Church from the time of Irenæus (180 A.D.). How came this tradition if "at Ephesus" was lacking in the text from the beginning? The answer to this question seems to rest between two theories. The one assumes that Paul wrote the letter to a group of churches with which he was not personally acquainted, situated outside of Ephesus, the association of the Epistle with this city coming from the natural drift of the original manuscript to this metropolitan centre and its preservation there (Zahn), the name of the less-known church which it must have contained being finally removed for that of the larger one (Jülicher). The other theory is that Paul wrote the letter to a group of churches of which Ephesus was the leading one, but all local references to which were laid aside because of the general character of the letter (A. Robertson), phrases being substituted which would agree with the fact that with the larger number of the group he was personally unacquainted. In this case the original manuscript would have had "at Ephesus" in the text, since the letter went in the first instance to the parent church; but from the copy made for the other churches it would be omitted, Tychicus supplying the name of the locality as he brought the letter to it, coming finally to Laodicea, the last city of the circuit where his copy was left. This would explain Marcion's finding of our Epistle there without "at Ephesus" in the text and also the reference in Colossians (Col. iv. 16, "When this epistle hath been read among you, cause that it be read also in the church of the Laodiceans; and that ye likewise read the epistle from Laodicea") to the letter which that church was to receive from Laodicea, which was the natural head of this Lycus-valley group. The similarity between Ephesians and Colossians referred to above is very close, as the most cursory reading will show. This extends not only to the doctrinal content, but even, in many instances, to words and phrases. Yet neither Epistle seems to have been actually a mere imitation of the other. The most satisfactory theory is that after Paul had written his special message to the church of Colossæ (See COLOSSIANS, EPISTLE TO THE), he decided to send a somewhat similar, but more general and less personal, letter to the circle of churches in the Roman Province of Asia since all were in need of the same type of instruction and faced by the same disturbing problems. Tychicus, the bearer of the Colossian Epistle, was also the bearer of this circular letter.

Bibliography. The literature on Ephesians is in most cases the same as that on Colossians and will be found listed at the close of the article on that Epistle. Consult also Hort, *Prolegomena to Romans and Ephesians* (London, 1895), and Lightfoot, "Destination of Epistle to Ephesians," in *Biblical Essays* (ib., 1893).

EPH'ESUS (Lat., from Gk. Ἔφεσος, *Ephesos*). One of the 12 Ionic cities of Asia Minor. It was situated in Lydia, near the mouth of the river Cayster, on two hills, named Coressus and Prion, in the midst of an alluvial plain (Map: Greece, Ancient. E 3). Its origin is enveloped in myths, as is that of all the Ionic cities; but the reputed founder of the Greek city of Ephesus was Androcles, son of Codrus, the last King of Athens. The population was by no means all Ionic, as appears from the fact that the Ephesians did not celebrate the great Ionic festival of the *Apaturia* (see Greek Festivals), nor were they divided into the four Ionic tribes. (Consult Hogarth, *Ionia and the East*, pp. 45 ff., Oxford, 1909.) The presence of the great temple of Artemis (see Diana, Temple of) seems to have made it a sacred place from an early time, and its situation at the starting point of one of the great trade routes into the interior of Asia Minor led to its commercial prosperity. It suffered from the Cimmerian invasion, about 655 B.C., and early submitted to the Lydians under Crœsus and later to the Persians under Cyrus the Great. During the Græco-Persian wars we hear little of the city, and it played no prominent part during the Peloponnesian and later wars. After the time of Alexander the Great the prosperity of Ephesus seems to have greatly increased. The city was strengthened and improved by Lysimachus and the kings of Pergamon. The Romans made it the capital of the Province of Asia. Under the emperors it was the most prosperous trading city in western Asia Minor, though we hear of complaints that the right of asylum possessed by the temple of Artemis was abused. The Roman Governor of Asia proceeded first to Ephesus and took office there. The account of St. Paul's labors in Ephesus, lasting nearly three years, shows the prosperity of the place and the importance of the temple in promoting that prosperity, as well as the passionate devotion of the people to their great goddess (Acts xix). A vigorous Christian church was established in the city, and later the Apostle John and other prominent men of the apostolic age made their headquarters at Ephesus. The Bishop of this church was the first of the seven to whom the Apocalypse was addressed. The destruction of its great temple by the Goths in 263 A.D. gave it a blow from which it never recovered. In 431 it was the scene of the Third General Council of the Christian Church. Its general history, while it was a city of the Byzantine Empire, was unimportant, and before the days of Tamerlane it had almost completely perished. Certain cabalistic words or sayings said to have been inscribed on the base of the statue of Artemis were copied and carried about as charms. Hence to a large number of similar charms hung about the neck and repeated in a low tone to avert danger was given the name *Ephesiæ litteræ*, or Ἐφέσια *γράμματα*.

Before 1863 little was known of the topography of Ephesus, though the remains of the stadium, theatre, so-called gymnasium, and a few other buildings and walls could be traced. Wood's excavations in search of the temple of Artemis, made for the British Museum, assisted in clearing up some of the uncertainties in the plan. (See, further, Diana, Temple of.) However, it was not till the Austrian Archæological Institute began its systematic explorations that any very definite information was obtained concerning the ancient city as a whole. Work was begun in 1896 and is not yet completed; indeed, the excavations have not been carried below the Imperial level. The great harbor is now known to date from the Hellenistic period (it had been thought to be Roman). A broad street leading from the harbor past the theatre (a structure dating from Christian times, which has been fully excavated) and terminating in a triumphal arch furnishes a starting point for the determination of the topography of the city. Other discoveries include two large market places—one Greek, the other Roman—surrounded by colonnades and rooms, a large number of inscriptions, and many statues and reliefs, among them a bronze athlete, using the strigil, of remarkable beauty. Consult: Guhl, *Ephesiaca* (Berlin, 1842); Curtius, *Ephesus* (ib., 1874); Wood, *Discoveries at Ephesus* (London, 1877). For reports of the Austrian excavation, consult: *Anzeiger der philosophisch-historischen Klasse der kaiserlich-königlichen Akademie der Wissenschaften in Wien* (Vienna, 1897 et seq.); *Jahreshefte des österreichischen archäologischen Instituts* (ib., 1898 et seq.); Benndorf, Heberdey, etc., *Forschungen in Ephesus*, vol. i (ib., 1906); "Ephesos," in Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914). For excavations in the temple of Diana by D. C. Hogarth, see Diana, Temple of.

EPHESUS, Councils of. Many councils were held at Ephesus, of which two deserve special mention: 1. The Third Ecumenical Council, which opened on June 22, 431. It was called by the Emperor Theodosius II at the request of the orthodox, represented by Cyril, Patriarch of Alexandria, and of Nestorius, Patriarch of Constantinople, whom Cyril accused of heresy because he taught that the two natures in Christ are not united in one personality; hence Mary was not the "Mother of God," but of Christ, the Man with whom God was joined. Nestorius requested that action upon the disputed doctrine be deferred until the Syrian bishops, whose votes he hoped would decide the matter in his favor, should arrive. The opening of the council was delayed 16 days, but they did not come. On the very first day the matter was settled against Nestorius, and he was excommunicated and deposed. When the Syrian bishops finally arrived (June 26 or 27), they held a meeting, and protested against the action of the synod, excommunicated Cyril, and appealed to the Emperor. But Nestorianism was doomed. The council was attended by about 200 bishops and closed on July 31. (See Nestorius.) 2. The other famous synod was convened in August, 449, also by the Emperor Theodosius II. Under the lead of Dioscurus, Patriarch of Alexandria and successor to Cyril, it proceeded to secure the restoration of Eutyches, who taught one nature in Christ, viz., the divine, and who had been deposed therefor by the Synod of Constantinople in 448, and the confirmation of this doctrine, which was favored by the Alexandrians. The council was marked by great disorder and even violence. Soldiers were brought in, blood was shed, and Flavian of Constantinople was so maltreated that he soon died. But the Alexandrian doctrine was indorsed. The council is called the Robber Synod, and its decision was quickly reversed by the Ecumenical Council of Chalcedon (451). Consult Perry, *The Second Synod of Ephesus* (Dartford, 1881). See Eutyches.

EPH'IAL'TES (Lat., from Gk. Ἐφιάλτης). 1. A son of Poseidon and Iphimedia. See Aloadæ. 2. The Malian who showed the Persians a mountain path by which they were enabled to come up behind Leonidas and his band of Spartans at Thermopylæ and destroy them. See Leonidas; Thermopylæ.

EPH'OD (Heb. *êphôd*, vestment). The name of one of the garments worn by the high priest

(Ex. xxviii. 6–8), but worn also by temple servants in general. Samuel wears one (1 Sam. ii. 18), and also the 85 priests of Nob (1 Sam. xxii. 18). Likewise David wears an ephod when dancing before the ark (2 Sam. vi. 14). It may be assumed that the ordinary ephod made of linen was less ornate than the one used by the high priest, which was made of costly material and of various colors—blue, purple, scarlet, and fine linen, interwoven with gold thread. It was held in place by two shoulder straps, attached to it behind and passing over the shoulders to the front. On the top of each of the shoulder pieces was an onyx stone on which the names of the 12 tribes were engraved, six on each stone. The ephod was worn over a blue frock, and on its front was the jeweled breastplate containing the oracle pouch for the Urim and Thummim. Ephod is also used in the Bible for image. Gideon is said to have made himself an ephod of the golden rings taken from the Midianites and to have set it up in Ophrah (Judg. viii. 27). It was evidently an object of worship, and since 1700 shekels were spent on it, it is natural to suppose that the ephod was the chief object in the sanctuary. Elsewhere, too, the ephod is spoken of in a manner to permit of no doubt that a part of the equipment of a sanctuary is meant. In Judg. xvii–xviii Micah provides for an ephod, and here and elsewhere the ephod is placed side by side with the teraphim (e.g., Hos. iii. 4), which were small images set up in one's household and used in divination. The ephod may therefore have been used in connection with the teraphim.

To reconcile two such divergent uses of the same term various theories have been put forward. The most probable supposition is that the ephod was originally the covering of a divine image. This vestment of gold, silver, or fine cloth embroidered with precious metals, was the most valuable part of the idol, and the name could therefore be applied to the image itself. In this garment, or shoulder cloth, there apparently was a pouch containing the oracle lots. It has been supposed that this vestment could be removed from the image and that the priest put it on when giving oracles. The name may then have been generalized and become the term for the garment worn by the priest when he came to the sanctuary to seek an oracle. Gressmann thinks that the linen ephod originally belonged to Nabu-Nebo, who since earliest times was worshiped in Syria and of whom the linen garment, the tablets of destiny on the breast, and the divination are characteristic. Consult: Foote, "The Ephod," in *Journal of Biblical Literature*, vol. xxi (1902); Sellin, *Das altisraelitische Ephod* (Giessen, 1906); Gressmann, in *Die Religion in Geschichte und Gegenwart* (Stuttgart, 1910).

EPHOR. See Ephori.

EPH'ORI (Lat., from Gk. *ἔφοροι*, *ephoroi*, overseers, from *ἐπί*, *epi*, upon, over + *ὁρᾶν*, *horan*, to look). An order of magistrates at Sparta. Herodotus attributes their creation to Lycurgus, and Aristotle to King Theopompus, while it seems clear that the Alexandrian chronologists had a list which extended back to about 757 B.C. As they appear in Spartan colonies of Thera and probably Tarentum, they must have early become an established part of the Spartan government. It is clear that they gradually took into their hands the real power, while the share of the kings in the government was lessened, especially as a result of the jealousy between the two royal houses. (See Sparta.) Their name seems to indicate that they were originally appointed to see that the discipline of the state was observed. The ephori were five in number; they were elected annually by and from all Spartans, and the decision of a majority was binding on the board. Every full citizen was eligible. During the fifth and fourth centuries B.C. the ephori are the governing body at Sparta; they convoke the Council of Elders and the Assembly, carry out decrees, receive ambassadors, determine the mobilization of the army, and during the war are kept informed of affairs in the field by secret dispatches, while two of the board always accompany the King in his campaigns. As presidents of the Council of Elders, they could bring even the kings to trial, and it is clear that their almost unlimited power during their short term caused much dissatisfaction to the more independent kings. The revolution of Cleomenes III temporarily destroyed their power, and, though after his overthrow in 221 B.C. the old forms were nominally restored, the ephori do not seem to have become again the ruling body. Even in Roman times the old name was retained by a board of five magistrates at Sparta, but we are not informed as to their duties. Consult: Dum, *Die Entstehung und Entwickelung des spartanischen Ephorats* (Innsbruck, 1878); Meyer, *Forschungen zur alten Geschichte* (Halle, 1892); Gilbert, *The Constitutional Antiquities of Sparta and Athens* (Eng. trans., London, 1895); Kuchtner, *Entstehung und ursprüngliche Bedeutung des spartanischen Ephorats* (Munich, 1897); Szanto, article "Ephoroi," in Pauly-Wissowa, *Real-Encyclopädie der classischen Altertumswissenschaft*, vol. v (Stuttgart, 1905). For a list of the ephors, consult Poralla, *Prosopographie der Lakedaemonier bis auf die Zeit Alexanders des Grossen* (Breslau, 1913). Consult, finally, the Greek histories of Grote, Holm, Busolt, and E. Meyer.

EPH'ORUS (Lat., from Gk. Ἔφορος) (c.400–c.330 B.C.). A Greek historian, a contemporary of Philip and Alexander. He was born at Cyme in Æolis and studied rhetoric under Isocrates, who, it is said, persuaded him to devote himself to history instead of to oratory. His chief work was *Ἱστορίαι*, a history of the Greeks and the barbarians from the return of the Heraclidæ (see Dorians) to the siege of Perinthus by Philip of Macedon (340 B.C.), a period of 750 years. The work, which was the first universal history attempted in Greece, consisted of 30 books, each of which contained a compact portion of the history and was thus complete in itself. Though Ephorus' style was feeble and diffuse, he appears to have been a faithful narrator, and his work was highly valued on account of the wealth and excellent arrangement of its material. It was the chief source of Diodorus Siculus (q.v.) and was commended by Polybius and Strabo. The few fragments were published in Müller's *Historicorum Græcorum Fragmenta*, vol. i (Paris, 1868): this work contained also a discussion of the life and writings of Ephorus. Consult Klügmann, *De Ephoro Historico Græco* (Göttingen, 1860), and Bury, *The Ancient Greek Historians* (New York, 1909). Under Cratippus will be found a reference to the fragments of a Greek historian, published in 1908, in *Oxyrhynchus Papyri*, v. Walker, *The Hellenica Oxyrhynchia: Its Authorship and*

Authenticity (Oxford, 1913), maintains that Ephorus was the author of this fragment. Walker's book gives the literature of the discussion of the fragment.

EPHRAEM, ĕ′frȧ-ĕm, or **E′PHREM SY′RUS**, Ephraim the Syrian (c.306–?378). The greatest of the Syrian church fathers, known as the Prophet of the Syrians. He was born at Nisibis, Mesopotamia, about 306. He was a pupil of Jacob, Bishop of Nisibis (died 338), became a teacher in the latter's school, and in 325 accompanied him to the Council of Nicæa. In 363 Nisibis was ceded by the Emperor Jovian to the Persians, and Ephraim took up his abode at Edessa (Orfa). He became a hermit and lived in a cave near the town. Towards the end of his life he is said to have visited Basil the Great at Cæsarea in Cappadocia, who tried to make him a bishop, but he refused any higher office than the diaconate. He died at Edessa in 373 or 378. His death is said to have been hastened by his efforts to relieve the sufferers from plague and famine then raging at his home. An extraordinary mass of fable and legend is contained in two recensions of an anonymous life of Ephraim. It is certain that he was a zealous upholder of orthodoxy and wrote and preached unceasingly against idolaters, "Chaldees," Jews, and all heretics. He was a voluminous writer and has left commentaries on nearly all the Old Testament in the Syriac or Peshitto version, as well as many homilies, and several hymns of much merit. His works exist partly in the original Syriac, partly in Greek, Latin, and Armenian translations. They were edited by the Assemani (Rome, 1732–46). There is also an edition of *Opera Selecta* by Overbeck (Oxford, 1865). Consult in English: Morris, *Select Writings of Ephraim the Syrian* (Oxford, 1847); Burgess, *The Repentance of Nineveh* and *Select Metrical Hymns and Homilies* (London, 1853); Harris, *Fragments of Ephraim Syrus upon the Diatessaron* (Cambridge, 1895); Hill, *A Dissertation on the Gospel Commentary of Ephraim the Syrian* (London, 1896); Seebright, *A Short History of Syriac Literature* (London, 1894). There is a prose translation of several hymns and homilies, with an introduction by John Gwynn, in *Nicene and Post-Nicene Fathers*, 2d series, vol. xiii (New York, 1898).

EPHRAIM, ĕ′frȧ-ĭm (Heb., fertile, fruitful tract). The name given, in Gen. xli. 50–52, to the younger son of Joseph by his wife Asenath. He is regarded as the eponymous ancestor of the tribe of Ephraim. The territories of the tribe in Palestine (q.v.) extended from the brook Kanah, where Manasseh began, southward, including the rich country spoken of as "Mount Ephraim" (Josh. xvi. 5 et seq.) (Map: Palestine, E 5). It is to be noted, however, that the Hebrews did not succeed in driving the Canaanites out of this district (v. 10), so that in all likelihood some mixture of Hebrews with Canaanites took place. The tribe was, perhaps, the most warlike in Israel. Joshua, the conqueror of the Holy Land, was an Ephraimite (Num. xiii. 8), and further proof of their warlike spirit appears in Ephraim's protests against Gideon (Judg. viii. 1) and Jephthah (Judg. xii. 1–7) for not asking aid of them in their wars. Shiloh, at one time the seat of the tabernacle, was in Ephraim, and the prophet Samuel belonged to the tribe (1 Sam. i. 1). Ephraim took part in the revolt of Saul's son, Ishbosheth (2 Sam. ii. 8–9), and later in the successful revolution of Jeroboam (1 Kings xii. 1–20). After this revolt Ephraim is merged in the northern kingdom, and of this kingdom it formed by far the most important part.

The story told in Gen. xlviii. 15–19, of the preference which Jacob gave to Ephraim in blessing him before Manasseh, although the latter was the older son of Joseph, truthfully reflects this superior position which Ephraim occupied in the northern kingdom, and its general prominence in Hebrew history before the Exile. The tribal traditions furthermore indicate that at one time Manasseh, Ephraim, and Benjamin constituted a single tribe known as Joseph. Benjamin was the first to cut loose, and hence becomes, in tribal metaphor, the younger brother of Joseph. For a time Manasseh and Ephraim remained together, and even in Solomon's days they still united for administrative purposes, but at last Ephraim also cut loose and eventually outranked Manasseh.

EPHRAIM (Gk. 'Εφραίμ, *Ephraim*). A town mentioned in John xi. 54, to which Jesus retired because of the hostility manifested by the Jewish authorities after his raising of Lazarus (Map: Palestine, C 4). The place is described as "near to the wilderness" (uncultivated pasture land) and is probably to be identified with the modern *Et-Taiyibeh*, about 4 miles northeast of Bethel, the modern *Beitin*. The Ephraim of 2 Sam. xiii. 23 and of 2 Chron. xiii. 19, the Aphairema of 1 Macc. xi. 34, and the Ephraim of Josephus, *Wars*, iv. 9, all probably represent the same place. Practically nothing is known of its history.

EPHRAIM CO′DEX. See Bible.

EPH′RATA. A borough in Lancaster Co., Pa., 38 miles (direct) east by south of Harrisburg, on the Philadelphia and Reading Railroad (Map: Pennsylvania, J 7). It is a health resort and has manufactories of cigars, silk, underwear, and hosiery. The borough owns its water works and electric-light plant. Ephrata is noteworthy chiefly on account of having been formerly the seat of the mystic Order of the Solitary, a semimonastic order of Seventh-Day Dunkers. The community, which contained both men and women, was founded by Johann Conrad Beissel (q.v.), in 1732. The members adopted a peculiar dress, somewhat resembling that of the Capuchins or White Friars, and the men wore long beards. Celibacy was looked upon as praiseworthy, but marriage was permitted. Property was held in common, although private ownership was not forbidden. Many of the members were well educated; Peter Miller, second prior of the monastery, translated the Declaration of Independence into seven languages, at the request of Congress. A printing press was set up, and a number of works, in both English and German, some of them very beautifully made and now highly prized, were published. At the period of its greatest prosperity the community contained nearly 300 persons, but about the time of the Revolution it began to decline, and few traces now remain. Pop., 1900, 2452; 1910, 3192. Consult Gibbons, *Pennsylvania Dutch and Other Essays* (Philadelphia, 1872), and Sachse's exhaustive two-volume work, *The German Sectarians of Pennsylvania* (ib., 1899–1900).

EPHYDRA, ĕf′ĭ-drȧ (Neo-Lat., from Gk. ἔφυδρος, *ephydros*, living on the water, from ἐπί, *epi*, upon + ὕδωρ, *hydōr*, water). A genus of small flies, of the family Ephydridæ, whose eggs and larvæ are eaten by American Indians. One species (*Ephydra hians*) is cultivated by the native Mexicans, as was the custom of their ancestors. Another species furnished food to the aborigines about Mans Lake, Cal. For full details, see FLY.

EP′IC CYCLE. The name given to a series of poems produced by various Greek poets of the Ionian school, between c.800 and 550 B.C. These productions were later combined with the Homeric poems into an epic cycle designed to give a complete survey of mythology from the marriage of Uranus and Gæa to the death of Ulysses; their writers were hence known as cyclic poets (q.v.). Among their works were the *Cypria* of Stasinus, forming an introduction to the *Iliad*, and the *Æthiopis* and *Iliu Persis* of Arctinus, forming its continuation. The interval between the *Iliad* and the *Odyssey* was covered by the *Nosti* of Agias of Trœzen, and the *Odyssey* was supplemented by the *Telegonia* of Eugammon of Cyrene. Of these and other works only the titles, authors' names, and some fragments have come down. The poems are chiefly of importance from the fact that the dramatists drew on them for their versions of the myths. They were later arranged for educational purposes by the so-called cyclographs and illustrated by artists. A specimen of these collections, the famous Tabula Iliaca (q.v.), is in the Capitoline Museum at Rome.

EP′ICHAR′MUS (Lat., from Gk. Ἐπίχαρμος, *Epicharmos*) (c.540–450 B.C.). The greatest of the Sicilian comic poets. He was born in Cos, but spent practically all his life in Sicily, mainly at Syracuse. Tradition says that he lived to be 90 years of age and was greatly honored by the Syracusans. Epicharmus doubtless owed much to the Syracusan tyrants, Gelon and Hiero, who generously aided lyric and dramatic poets, that they might increase the brilliancy of their courts; it was probably under their patronage that he produced his comedies, the representative plays of the Sicilian or Dorian comedy. These numbered 36 (according to some authorities 52) and roughly fall into two classes—mythological travesties and realistic scenes from common life—as the extant titles show. To the first belonged his *Busiris, Cyclops, Hephæstus, Marriage of Hebe*, and *Prometheus;* to the second, *The Peasant, The Visitors at the Festival, etc.* The second class introduced new themes, among them that of the parasite, closely allied to those of the mime (q.v.), which was also first developed in Syracuse. Plato called Epicharmus master of the comic type, and Horace (Epistles, ii, 1, 58) preferred him to Plautus (q.v.). Ennius named after him his didactic poem on natural philosophy. While Athenian comedy was a local development, no doubt Epicharmus' influence on Attic comedians of the fifth century was not without its effect. Yet the statement that Epicharmus was the inventor of comedy (due to an epigram, No. 17, of Theocritus) can be true only in this: that Epicharmus was one of the first to give comedy developed and artistic form. He was famous for his philosophical utterances, and his comedies continued to be studied long by philosophers and grammarians; Apollodorus, of Athens, in the second century B.C., published an edition in 10 books. The extant fragments are edited by Lorenz (Berlin, 1864); Kaibel, *Comicorum Græcorum Fragmenta*, part i (Leipzig, 1899). Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (5th ed., Munich, 1908).

EPICŒNE, ĕp′ĭ-sēn (Gk. *ἐπίκοινος, epikoinos*, of either gender, promiscuous), or THE SILENT WOMAN. A comedy by Jonson (1609). Morose, an old man who dislikes noise, is led to marry Epicœne, because of her reputation for silence, and in order to disinherit his fortune-hunting nephew, Dauphine. After the marriage Epicœne at once becomes a noisy shrew; and Morose, by promises of reward, secures his nephew's help in releasing himself from her. Thereupon Dauphine shows Epicœne to be a disguised boy, whom he had brought to his uncle to play him a trick.

EP′IC POETRY. A species of narrative poetry, dealing with an action or series of actions and events of permanent interest and power. Its theme, however varied in its aspects and issues—and the epic manner favors multiplicity here—must be, in the last analysis, single in its nature and must be developed in the region of the ideal. Acts of trifling importance are not for this reason excluded from epic poetry, which rather, in its endeavor to give a broad survey of human life, abounds in matters of everyday occurrence. But these should form, at the most, only a background for the elevation and greatness of the rest and must, like them, be set forth in noble phrase. By the Greeks of the classical period it was, from one point of view, distinguished from lyric poetry by being recited or rather given in recitative instead of being sung, and from dramatic poetry by being simply narrated instead of acted. But there is a further difference, as they also saw. A lyric is the expression of sentiment and mood, while a drama deals primarily with the delineation of character through external action. In either case the interest is wholly personal and lies in the portrayal of the character of the individual. The course of events, which in the drama forms the plot, is the means whereby this portrayal is accomplished and gains its value from this fact, and not primarily from its own intrinsic interest. The web of the action is closely and compactly woven to show the development of character. The successive scenes have a direct and logical bearing upon the statement and solution of the problem; and thus episodes, which form an important feature of epic structure, are properly excluded from the drama. The epic poem, on the contrary, to quote the words of Dr. Butcher, "relates a great and complete action, which attaches itself to the fortunes of a people or to the destiny of mankind, and which sums up the life of a period. The story and the deeds of those who pass across its wide canvas are linked with the larger movement of which the men themselves are but a part. The particular action rests upon forces outside itself. The hero is swept into the tide of events. The hairbreadth escapes, the surprises, the marvelous incidents of epic story, only partly depend upon the spontaneous energy of the hero." In the poems universally recognized as epics the personages of the action, and the forces outside it, alluded to in the quotation above, are concretely presented through the poetical machinery of a double plot and two spheres of action with many points of contact—a human plot and a divine plot, complicated and resolved in the *Iliad* and the *Odyssey*, e.g., by the gods of mythology on the one hand and by the Greek and Trojan heroes on the other. A like double plot is found in Vergil; and in Milton God and Satan and their opposing hosts play their parts and determine the course of the human story of man's first disobedience. In Tasso's *Jerusalem Delivered* and in the *Lusiad* of Camoëns the, so to speak, celestial and terrestrial plots again coexist. Another mark of works universally accepted as epics, as implied in the quotation from Dr. Butcher, is their tendency to be social or national as opposed to individual, to sum up and express in essence an epoch and a nation—witness the great Greek and Roman epics—or an epoch and a great company of people with a solidarity of faith, thought, and sentiment, as in the case of Dante's *Divina Commedia*, which is the voice of mediæval Catholicism, or of Spenser's *Faerie Queene* and Milton's *Paradise Lost*, which are the expressions respectively of the Renaissance in England and of the sterner Puritanism of a later day. The great types of character of the primitive epic are national rather than individual, and in the contemplation of them the nation recognizes with exultant pride its glorious achievements and ideals. Among the Greeks, e.g., this was the secret of the power exercised by the *Iliad* and the *Odyssey*, and for the French by the *Chanson de Roland*. Again, in the *Æneid*, in which the divine purpose that Rome should wield the empire of the world is carried out through human instruments, the Roman people itself is the real hero, as indeed Vergil's contemporaries must have seen when they called the poem *Gesta Populi Romani*.

Epic poems fall naturally into two divisions: (1) those which, like the *Iliad*, the *Chanson de Roland*, and the *Mahâbhârata*, are the outcome of a period of spontaneous composition of epic songs; (2) those which, like the *Æneid*, the *Gerusalemme liberata*, and *Paradise Lost*, are the creation of highly cultivated and widely read minds, consciously using a long-established form and accepted models. The artistic excellence of the Homeric poems, which stand at the beginning of historical Greek literature, necessarily presupposes an extended period of poetic production, during which the material, partly mythological, partly historical, of these long poems formed the subject of numerous shorter folk songs. In the *Iliad*, e.g., Achilles, to please his friend Patroclus, sings in his hut before Troy of the κλέα ἀνδρῶν; and, in the *Odyssey*, the blind minstrel Demodocus, at the court of Alcinoüs, sings to the assembled company at the hero's request a particular lay about the making of the wooden horse by means of which Troy was taken—a lay which, as the context clearly implies, belonged to a longer tale about Troy. Such epic, or epic-lyric, songs must have abounded and must have shown infinite variation of incident and expression; for they were the products of a youthful and buoyant age, in which fancy, not the passion for scientific accuracy, was supreme. This is, in fact, characteristic of popular poetry everywhere. It is markedly impersonal and national. All its elements—structure, metre, phrase, style —are common property, and every complete poem is equally a part of the general stock. It is never simply repeated, but at each recitation undergoes fresh changes. In Italy, in Servia, or in Russia a song of 8 or 10 lines will show endless variations, and in Finland, where the entire traditional poetry has one unvarying form, we find a perfect type of popular poetry. Each song, says Comparetti, "not only differs between singer and singer, but even the same singer never repeats it twice in exactly the same manner, often going so far as to bind together and give as one those songs which but recently he recited as separate and distinct." This last fact is especially noteworthy as bearing upon the way in which the epic song ultimately grew into the epos. In the Icelandic *Poetic Edda* the lays which preserve different parts of the earlier and grander form of the Völsung-Nibelung story show great diversity of treatment of a common legend. The material of these and other lays, not now extant, was worked up into the prose *Völsunga-Saga*, the action of which, as of the lays, moves wholly in the sphere of the magical and supernatural and shows no trace of Christian influence. But when towards the end of the twelfth century this story, common to all the Teutonic stock, finally takes place in south Germany as an epic poem, not only is the tale itself different at times in detail and incident, but the entire atmosphere and setting is changed. History has taken the place of myth. Brunhild is no longer a Valkyr, nor is Siegfried able to change his shape. Belief and manners are Catholic and mediæval instead of heathen and primitive. Early French epic poetry shows, perhaps, even more clearly the continuous change and growth of popular song. The *Chansons de Geste*, as the name implies, deal with historical facts; but it is history transformed and glorified by passion and imagination. If one examines the *Chansons* (whether, like the *Roland*, the *Pèlerinage de Charlemagne*, the *Roi Louis*, they belong to the royal period, or, like *Renaud de Montauban* and *Girard de Roussillon*, to the feudal), one discovers at once the same conditions that appear among the Teutons and the Finns—a mass of fluctuating poetic thought in a perpetual state of composition, decomposition, and recomposition. This poetry developed among the warrior class and those attached to its service, and there is no doubt that the songs contemporary with the events were often composed and chanted by the knights themselves. But they were especially composed and made familiar to all by the minstrels, the *jongleurs* (q.v.). In the endeavor to please by giving a touch of novelty to a favorite old poem, they would combine two or three songs, modify them to remove discrepancies, and amplify for the sake of poetical embellishment or more stirring description of incident. In this way there came into existence an immense body of epic material contained in short songs, which towards the middle of the eleventh century began to take the form of long epic poems. Finally, the composition of the *Chansons de Geste* comes to an end in a period (from the end of the twelfth century to the middle of the fourteenth) which is analogous to that of the cyclic poets in Greece. The greatest of these epics, the *Chanson de Roland*, must be dated, in its earliest extant form, full three centuries after the defeat at Roncesvalles (c.778), upon which historical event it is based; and it weaves into its story dim memories of the personages and events of later periods. Over 100 years later a redaction in rhyme instead of assonance appears, with a new ending of some 2000 lines; and of this version we have again a large number of *remaniements*, or rehandlings. Moving and fine as is the poetry of the *Roland*, it still lacks something of the breadth and variety of the great narrative poems which may be said to constitute the norm of this literary *genre*.

The conclusions as to the genesis of epic poetry to which we are thus far led are strengthened by a study of the Sanskrit *Mahâbhârata.* There was a like warrior class, the Kshatriyas, proud of its valorous deeds and delighting in their celebration in song; and there is no reason to doubt that, in India as in Greece, Iceland, Germany, and France, popular poetry flourished in the form of short epic lays.

That the poems which are sometimes called the epics of growth were formed out of earlier *kleine Lieder* is now universally accepted. What is still a warmly disputed point is the mode in which the combination was finally effected. Was the epos a mere compilation of these shorter lays, more or less ingeniously fitted together, with the help, perhaps, of some new connecting links, but still with such preservation of the original masses that the modern scholar with his critical acumen can discern the junctures? Or, was the entire material so fused in the mind of some one great poet as to come forth a homogeneous and organically related whole? In 1795 F. A. Wolf published his famous *Prolegomena to Homer*, in which he argued at length for the view that "Pisistratus was the first who had the Homeric poems committed to writing and brought into that order in which we now read them." Karl Lachmann, in two papers read to the Berlin Academy in 1837 and 1841, maintained that the *Iliad* was made of 16 independent lays, with various enlargements and interpolations, all finally reduced to order by Pisistratus. Since that time the Homeric question has been much discussed, and widely divergent theories, differing both in principle and in detail, have been put forth by scholars who deny the unity of the *Iliad* and the *Odyssey*. Mr. Walter Leaf, e.g., in his *Companion to the Iliad* (1892), holds that, to an original *Wrath of Achilles* (about 3400 lines in length), there were added in different ages extensive expansions and interpolations, as well as short passages by which the transitions from one piece to another of different age were managed; and he presents a tentative scheme of the lines belonging to each of the five strata that he postulates. In regard to the *Nibelungenlied*, M. Lichtenberger, a sane critic, believes that some nameless redactor put together the ancient lays after they had been adapted to the manners of an age of chivalry; and M. Gaston Paris is inclined to call the poet of the *Chanson de Roland* an *arrangeur* rather than an *auteur*.

An important contribution to the subject of epic poetry in general, as well as to the character of a particular epic poem was Signore Comparetti's study of the Finnish *Kalevala*. Out of the entire body of the traditional poems of the Finns, by a process of selection and arrangement and by the insertion of short transitional matter, Dr. Lönnrot constructed a perfect epos; though the popular singers, the *laulajat*, not only knew no such poem, but were unable to imagine one. In the edition of 1849 there are 50 cantos and 22,800 lines. Here, if anywhere, we have the genesis of an epic in accordance with the Wolfian and Lachmannian theory. Lönnrot, it is true, did not merely stitch together such definitely shaped songs as those into which Lachmann resolved the *Nibelungenlied* and the *Iliad.* At times he divided the runes, recombined their parts, and chose out of the innumerable variants those best fitted for his purpose. But in doing this without adding anything essential of his own, he adopted a procedure, not of the poet, but of the scholar—the heir of the ages, familiar with the Homeric question and with the theory of the epos. Comparetti argues at length that, to suppose a Greek of the time of Pisistratus, a *jongleur*, or even the Indian Vyâsa, capable of working in this way, is to commit a mere anachronism; that the *Kalevala* has in no sense that unity which is apparent in the *Iliad* and the *Odyssey*, in the *Chanson de Roland*, and even in the *Nibelungenlied;* and, finally, that "a long poem, created by the people, does not exist, cannot exist; epic popular songs, such as could be put together into a true poem, have never been seen, and are not likely to be seen among any people. Every long poem, without exception, anonymous or not, is the work of an individual—is a work of art."

Epic poetry has not been produced by all races nor by all nations. Thus, among the Servians, Russians, and Siberian Tatars, we find epic or epic-lyric songs; but they are never welded together into an epos. The same is true of the Celts, who, in both the branches of the race, the Gadhelic and the Cymric, developed an abundance of epic material, especially in the two great cycles of tradition, the Fingalian or Ossianic and the Arthurian. The Anglo-Saxon *Béowulf* is finely epic in substance, but has scarcely the range and complexity of a great epos. Spain, too, had her truly heroic figure—the Cid, the Roland of his country. But the ballads and the poem that sing his praises were never worked up into a great national epic.

It remains to consider briefly the epics of the second class. Like those of the first, these may deal with the traditions, mythical or historical, of the nation; but they are in every way the creation of an individual mind, from which they receive their atmosphere and color. They stand, therefore, in sharp contrast with the wholly impersonal work of Homer, e.g., in Greece, and the poets of the *Nibelungenlied* and *Gudrun* in Germany, and of the *Mahâbhârata* and *Râmâyana* in India—poems which are the natural outcome of a *fermentation épique*, as M. Gaston Paris calls it, and of which it may be truly said that the song dominates the singer rather than the singer the song. Epics of this personal character belong to no special period in the history of a people, and their number is still increasing. It must suffice to mention a few of these. In India the renaissance of literary activity in the fifth and sixth centuries A.D. produced those epics which, as being the work of a single poet (*Kavi*), are called *Mahâkâvya*, or great poems—a name already applied to their model, the *Râmâyana*, as being composed by Vâlmîki. In Greece, in the centuries immediately following the composition of the *Iliad* and the *Odyssey*, the so-called cyclic poets further developed and unified the Trojan cycle of legends. In the Alexandrian period the *Argonautica* of Apollonius Rhodius may be noted; and in our own era, between the fourth and sixth centuries, Nonnus and Musæus have some claim to distinction. At Rome national epic poetry was early cultivated by Nævius and Ennius and comes to its most perfect form in the Augustan age, in the *Æneid* of Vergil, undoubtedly one of the great epics of the world. Later we find the *Pharsalia* of Lucan, the *Punica* of Silius Italicus, the *Thebaïs* and *Achilleis* of Statius. In Persia, Firdausi, drawing upon good historical sources, composed the *Shah-Namah*, or 'Book of Kings'—a complete history of Persia, which was at once hailed with enthusiasm as the national epic. Among the great epics of modern times must certainly be reckoned the *Lusiad* of Camoëns, the *Orlando Furioso* of Ariosto, and the *Gerusalemme liberata* of Tasso, the *Faerie Queene* of Spenser, the *Paradise Lost* of Milton, and the *Messias* of Klopstock.

The epic has been written also in burlesque form, as e.g., in the *Batrachomyomachia*, or 'Battle of the Frogs and Mice.' The animal epic should also be mentioned, best represented by *Reineke Fuchs*.

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EP'ICTE'TUS (Gk. 'Επίκτητος, *Epictētus*, The Acquired: a nickname) (c.50–?). A celebrated Stoic philosopher, born at Hierapolis in Phrygia. He was at first the slave of Epaphroditus, a freedman of Nero, at Rome. He was afterward manumitted and devoted himself to the Stoic philosophy. Domitian hated him on account of his principles and banished him, along with several other philosophers, from Rome (90 A.D.). Epictetus settled at Nicopolis in Epirus, near Actium. Under the pressure of the times in which he lived his serious moral views received a character rather of self-denial than of energy. His pupil, Arrian, collected the maxims of Epictetus in the work entitled *Encheiridion* (Handbook) and in eight books of commentaries, four of which are lost. (See ARRIANUS.) The peculiar excellence of the writings of Epictetus is simple and noble earnestness. The real heartfelt love of good and hatred of evil, which are often thought to be exclusively Christian feelings, manifest themselves very finely and beautifully in the philosophy of Epictetus, yet there is no evidence that he knew anything of Christianity. There are several good editions of the works of Epictetus, the most complete of which is that of Schenkl (Leipzig, 1898). Consult translations by Mrs. Elizabeth Carter (London, 1758), Higginson (2 vols., Boston, 1890), and Long (London, 1848, 1877, 1892, 1897). Consult: Melcher, *De Sermone Epicteteo* (Halle, 1906); Arnold, *Roman Stoicism* (Cambridge, 1911); Ritter and Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1913).

EP'ICURE'ANISM. The name applied, often very loosely, to the system of philosophy based more or less on the teachings of Epicurus (q.v.). The philosopher himself, although the majority of his writings referred to natural philosophy, was not, properly speaking, a physicist. He studied nature with a moral rather than with a scientific design. According to him, the great evil that afflicted men—the incubus on human happiness—was fear: fear of the gods and fear of death. To get rid of these two fears was the ultimate aim of all his speculations on nature.

He regarded the universe as corporeal, as infinite in extent, and as eternal in duration. He recognized two kinds of existence—that of bodies, and that of vacuum or space. Of his bodies, some are compounds, and some are atoms or indivisible elements, out of which the compounds are formed. The world as we now see it is produced by the collision and whirling together of these atoms, which possess only the attributes of shape, size, and weight. Of these atoms there is an infinite number, varying in size and shape, but of equal specific gravity. These atoms naturally fall downward in the empty space, but the direction they take is not absolutely uniform. Hence come clashes between them, and combinations which result in the universe as we know it. But beyond our known world Epicurus held that there are innumerable others. He also held the doctrine of perception by *images* (Gk. *εἴδωλα, eidōla*), which are incessantly streaming off from the surface of all bodies, and which are necessary to bring man into relation with the world without. In like manner he believed that sounding bodies threw off emanations by which human beings were brought into sympathy with them, and that perception by smell took place in the same way. In psychology Epicurus was a decided materialist, holding, for various reasons, that the soul is a bodily substance, composed of subtle particles, disseminated through the whole frame, and having a great resemblance to spirit or breath with a mixture of heat. It is interesting to note that Epicurus, following Empedocles (q.v.), anticipated the modern doctrine of natural selection in maintaining that natural causes gave rise to various differences in organic forms, but only those able to support themselves and to propagate their species have survived. Epicurus did not deny that there are gods; but he strenuously maintained that, as "happy and imperishable beings," they could have nothing to do with the affairs of the universe or of men. This Epicurean theology is admirably expressed in the closing lines of Tennyson's *The Lotus Eaters*.

Epicurus next proceeds to deal with the fear of death. Having proved in his psychology that the dissolution of the body involves that of the soul, he argues that the most terrible of all evils, death, is nothing to us, since *when we are, death is not; and when death is, we are not.* It is nothing, then, to the dead or the living; for to the one class it is not near, and the other class are no longer in existence. The insight shown by this remark has not been sufficiently appreciated.

The ethical side of Epicurus' system may be noticed in a few words. He held that *pleasure* was the chief good, and it is from a misapprehension of the meaning of this word as used by Epicurus that the term "Epicurean" came to signify one who indulged his sensual appetites without stint or measure. At the same time it is easy to see that the use of the word "pleasure" was prone to produce the mischievous results with which the later Epicureanism was charged. The whole question of ethics, then, comes to a calculation and balancing of pleasure and pains; in other words, the cardinal virtue is *prudence*. Epicurus rests *justice* on the same prudential basis as temperance. Denying any abstract and eternal right and wrong, he affirms that injustice is an evil because it exposes the individual to disquietude from other men; justice is a virtue because it secures him from this disquietude. The duties of friendship and good-fellowship are inculcated on the same grounds of security to the individual. Epicurus is distinguished from his contemporaries by the fact that he taught the doctrine of the freedom of the will.

Among the Romans the system of Epicurus was adopted by many prominent men. Horace, Atticus, and Pliny the Younger were Epicureans; and the splendid poem of Lucretius is the finest literary expression that Epicureanism has achieved. In modern times Epicureanism was resuscitated in France by Pierre Gassendi, who published an account of Epicurus' life and a defense of his character in 1647. Many eminent Frenchmen have professed his principles: among others, Molière, Saint-Évremond, the Comte de Gramont, the Duc de la Rochefoucauld, Rousseau, Fontenelle, and Voltaire. Consult: Lange, *History of Materialism* (Eng. trans., Boston, 1886); Asener, *Epicurea* (Leipzig, 1887); Watson, *Hedonistic Theories* (Glasgow, 1895); Wallace, *Epicureanism* (London, 1880); Trezza, *Epicuro e l'Epicureismo* (Florence, 1877); Zeller, *Philosophy of the Stoics, Epicureans, and Skeptics* (Eng. trans., London, 1870; 2d ed., 1880); Kreibig, *Epicurus* (Vienna, 1886); Geodeckemeyer, *Epicurus' Verhältnis zu Demokrit in der Naturphilosophie* (Strassburg, 1897); Gizycki, *Ueber das Leben und die Moralphilosophie des Epicurus* (Halle, 1879); Gomperz, *Herculanische Studien* (Leipzig, 1865–66); Cassel, *Epikur der Philosoph* (Berlin, 1892); Guyau, *La Morale d'Epicure* (3d ed., Paris, 1886); Joyau, *Epicure* (ib., 1910); Taylor, *Epicurus* (London, 1911); Santayana, *Three Philosophical Poets* (Cambridge, Mass., 1910); Pater, *Marius the Epicurean* (2 vols., New York, 1913), presents in the form of a story the philosophical attitude of Epicureanism; and the histories of philosophy by Schwegler, Ueberweg, Windelband, and others. See EPICURUS; HEDONISM.

EP'ICU'RUS (Lat., from Gk. 'Επίκουρος, *Epikouros*) (c.342–270 B.C.). An illustrious Greek philosopher. He was born probably in the island of Samos, in December, 342, or January, 341, B.C., six or seven years after the death of Plato. His father, Neocles, is said to have been a schoolmaster, and his mother, Chærestrate, to have practiced arts of magic. In his boyhood he heard Pamphilus and Nausiphanes lecture on philosophy, but did not claim to be a pupil of either. At the age of 18 Epicurus repaired to Athens to present himself before the members of his demos and to be duly confirmed as an Athenian citizen. His stay at Athens on this occasion was not long; when he rejoined his father's family, however, it was not at Samos, but at Colophon, whither Neocles had repaired upon being dispossessed of his home at Samos. In his thirtieth year Epicurus was settled at Mitylene, and there he first won recognition as a philosopher; at Lampsacus two or three years later he became the head of a school. But Athens was the place where philosophers could expect to get their best hearing, and thither Epicurus returned about 306 B.C. Here he bought a garden which he used as the seat of his school. From this circumstance his followers were called the "philosophers of the garden." Although women as well as men frequented the garden, and although among these women were many of the *hetæræ* (q.v.), the life of the brotherhood was not marked by sexual excesses, popular scandal to the contrary notwithstanding. The calumnies which the Stoics circulated concerning the school are undeserving of notice. The success of Epicurus as a teacher was signal; great numbers flocked to his school from all parts of Greece and from Asia Minor, most of whom became warmly attached to their master as well as to his doctrines, for Epicurus seems to have been characterized not less by amiability and benevolence than by force of intellect. He died 270 B.C., in the seventy-second year of his age.

Epicurus was a most voluminous writer. According to Diogenes Laërtius he left 300 volumes. Among others he had written 37 books on natural philosophy, a treatise on atoms and the void, one on love, one on choices and avoidances, another on the chief good, four essays on lives, one on sight, one on touch, another on images, another on justice and the other virtues, etc. From all these works there have come down to us three letters and a number of detached sentences or sayings, preserved by Diogenes Laërtius in his life of the philosopher.

Outside of these the principal sources of our knowledge of the doctrines of Epicurus are Cicero, Seneca, Plutarch, and, above all, Lucretius, whose great poem, *De Rerum Natura*, contains substantially the Epicurean philosophy. To these must be added a large number of papyri found at Herculaneum about the middle of the eighteenth century. These contain fragments from Epicurus and many writings of Epicureans, especially of Philodemus. But unfortunately the manuscripts are in a deplorable condition. See EPICUREANISM.

EP'ICY'CLE (Lat. *epicyclus*, Gk. *ἐπίκυκλος*, *epikyklos*, epicycle, from *ἐπί*, *epi*, upon + *κύκλος*, *kyklos*, circle). The earlier astronomers assumed that all the motions of heavenly bodies take place in circles, and that all the heavenly bodies move round the earth, which remains at rest in the centre. The observed phenomena of the heavens, however, were soon seen to stand in glaring inconsistency with these assumptions. For the sun and moon, which manifestly do not always move with the same velocity, the eccentric circle (q.v.) was imagined. The case of the planets, whose motions were seen to be sometimes direct, sometimes retrograde, and sometimes altogether arrested, offered still greater difficulties; to get over which, the idea of *epicycles* was hit upon. According to this hypothesis, while a planet was moving in a small circle, the centre of that small circle was itself describing a larger circle about the earth. This larger circle was called the *deferent* (q.v.), and the smaller, which was borne upon it, was called the *epicycle*. In this way the motions of the planets about the earth were conceived to be something like what the motion of the moon about the sun actually is. By assuming proper proportions between the radii of the deferent circle and the epicycle, and between the velocities of the two motions, it was found possible to account for the motions of the planets.

EP'ICY'CLOID (Gk. *ἐπί*, *epi*, upon + *κύκλος*, *kyklos*, circle + *εἶδος*, *eidos*, form). If a circle moves on the outside of the circumference of another circle, every point in the circumference of the first circle describes an epicycloid. This curve first appeared in a work of Dürer's (1525), but the name is due to Roemer (1672). It has many remarkable properties and is also interesting from a practical point of view. The teeth of cogwheels must, as shown by Desargues, have an epicycloidal form, in order that friction may be minimum. The term formerly included the curve described when the moving circle was on the inside of the other, but this "inner epicycloid" is now called the "hypocycloid." For the equation of this curve and references to its history, see CYCLOID; and for a more extensive bibliography, consult the *Intermédiaire des Mathématiciens* (Paris, 1898, 1899).

EP'IDAM'NUS. See DURAZZO.

EP'IDAU'RUS (Lat., from Gk. *Ἐπίδαυρος*, *Epidauros*). A maritime town of ancient Greece, on the Saronic Gulf, in the northeast part of Argolis, situated on a small promontory, in lat. 37° 38′ N., long. 23° 10′ E. (Map: Greece, Ancient, C 3). The early history of Epidaurus is involved in myth, but numerous religious connections with Attica lend probability to the legend of an original Ionian population. Later, it was a Dorian city, closely connected with Argos, though not subject to that city. The greatest prosperity of Epidaurus seems to have been in the early period, when it was a member of the Calaurian Amphictyony and ranked as a naval power; at that time it controlled, it is said, Ægina and colonized Cos, Calydnus, and Nisyrus. Its power afterward declined, and during the historical period it owed its importance chiefly to the proximity of the celebrated sanctuary of Æsculapius, which attracted patients from all parts of the Greek world. The site of this temple was a plain surrounded by mountains, about 8 miles west of the town, still called Hieron (the sanctuary). Epidaurus (modern Greek, *Epidavro*) is now a small village, with scarcely 100 inhabitants, employed for the most part in raising vegetables for the Athenian market. The plain surrounding the village is productive and highly cultivated. Here, in January, 1822, a congress from all parts of Greece assembled, and promulgated the constitution, known as the Constitution of Epidaurus. The site of the sacred precinct was excavated, from 1881 on, by the Greek Archæological Society, under the direction of M. Kavvadias. Conspicuous among the ruins is the Tholos, a circular structure of large diameter, which excited the warm admiration of the ancients. The theatre of Epidaurus is one of the best preserved and the most beautiful of ancient theatres. In the sacred precinct were found two colonnades, a temple of Æsculapius, baths, gymnasium, and a hospital. Numerous inscriptions, too, were found, of great value with respect to the cult of Æsculapius. Consult: Gardner, *New Chapters in Greek History* (London, 1892); Diehl, *Excursions in Greece* (ib., 1893). The detailed descriptions may be found in the Πρακτικά of the Greek Archæological Society, particularly for 1881–84 and 1889; *Ἐφημερὶς Ἀρχαιολογική* (1883, 1885); Kavvadias, *Les fouilles d'Epidaure* (Athens, 1893); Defrasse and Léchat, *Epidaure* (Paris, 1895), magnificently illustrated with conjectural restorations of the principal buildings; Kavvadias, Τὸ *ἱερὸν τοῦ Ἀσκληπιοῦ ἐν Ἐπιδαύρῳ καὶ ἡ Θεράπεια τῶν ἀσθενῶν* (Athens, 1900). For a plan, consult Baedeker, *Handbook to Greece* (4th Eng. ed., Leipzig, 1909).

EP'IDEM'IC (Lat. *epidemus*, Gk. *ἐπίδημος*, among the people, from *ἐπί*, *epi*, upon + *δῆμος*, *dēmos*, people). A name applied to diseases which appear at intervals and spread over a certain area, or traverse a large section of the world and attack a large number of people. An epidemic disease may become endemic (q.v.) and remain permanently in a locality. Cholera is epidemic in certain parts of Europe, at intervals subsiding and disappearing, while it remains endemic in India. Probably all diseases which are epidemic in various parts of the world are endemic in certain localities, and the epidemics are brought by travelers from these localities, or follow commerce under favoring conditions, such as debility dependent upon exposure to miasms after inundations, swarming and migration of insects which carry contagion, e.g., mosquitoes carrying germs of yellow fever or of malaria. Drainage and paving of streets result in checking and eradicating an epidemic of malaria in a town. Opening the pavements and tunneling the streets afford harbors in damp spots and puddles for mosquitoes, which propagate rapidly, become infected with the plasmodium of malaria, and transmit the microörganism to human beings; and thus an epidemic of malaria is started. Epidemics of typhoid fever are almost invariably traced to one or a few cases of the disease, from whose excrement drinking water has become polluted. Epidemics are due, primarily, to dissemination of bacterial germs, though in some diseases of the contagious class (such as scarlet fever and smallpox) the causative germs have not yet been isolated. They must be checked, therefore, by bacteriological precautions. It is difficult to explain the cause of certain cycles in which epidemics appear to move, regularly recurring in certain localities; but in all cases precautions should be taken to quarantine people entering a port from an infected country, and clothing and all merchandise should be disinfected. Serum therapy (q.v.) promises a protection against many epidemic diseases, notably typhoid fever, as well as treatment during disease.

Epidemics of nervous diseases have appeared at times in the history of the world: as of chorea (q.v.) or of dancing mania. Under the leadership of a person afflicted with paranoia (q.v.), many people of unstable mental equilibrium have been dominated by suggestion (q.v.), and the results have been crusades, persecution of "witches," epidemics of suicides, etc. Consult Hecker, *Epidemics of the Middle Ages*, trans. by Babington (London, 1849), and Creighton, *The History of Epidemics in Great Britain* (2 vols., Cambridge, 1891-94). See CLIMATE; CONTAGION; INFECTION; CHOLERA; TYPHOID FEVER; INFLUENZA.

EPIDEMIC CEREBROSPINAL MENINGITIS. See MENINGITIS.

EP'IDEN'DRUM (Neo-Lat., from Gk. ἐπί, *epi*, upon + δένδρον, *dendron*, tree). A genus of strong-growing, long-stemmed epiphytal orchids, of which nearly 600 species have been found in Central America alone. Though some of the species produce showy blossoms, the majority have flowers of rather unattractive appearance, various shades of greenish purple being common. The group is of special interest, however, from its increasing popularity in hybridizing with the gaudier, weaker, short-stemmed, and more difficultly cultivated members of other genera, e.g., *Cattleya* and *Lælia*. The operation is of fairly easy performance and often results in vigorous plants, long stems, graceful racemes, and attractive flowers.

EP'IDER'MIS (Lat. from Gk. ἐπιδερμίς, upper skin, from ἐπί, *epi*, upon + δέρμα, *derma*, skin). The cuticle, or scarf skin, a semitransparent membrane, containing neither vessels nor nerves, and everywhere forming an external covering to the derma, or true skin. It consists of two distinct layers, viz., the *mucous layer*, which lies immediately upon the corium, and the *horny layer*, which forms the outermost surface of the body. The mucous layer (the *rete mucosum*, or *rete Malpighi*) is of a whitish or slightly brown tint (in the negro dark gray or black), and is composed of rounded or cuboidal cells, distended with fluid, and likewise containing minute granules, which diminish in number in the more external cells. The horny layer forms the external semitransparent part of the epidermis, which in the white races is colorless, and is composed almost wholly of uniform cells agglutinated and flattened. The color of the epidermis differs in different persons and in different parts of the body. It is deepest around the nipple, especially in women during pregnancy and after they have borne children. A more or less dark pigment is often deposited in persons who are exposed to the sun, in the face, neck, back of the hands, etc. These tints are not produced by special pigment cells, but are seated in the common cells of the mucous layer, round whose nuclei granular pigment is deposited. In the negro and the other colored races it is also only the epidermis which is colored. Morbid coloration of the epidermis (freckles, moles, etc.) is produced in the same way as the color of the negro's skin. Numerous instances of partially or entirely white negroes and of black Europeans, not as a consequence of change of climate, but as an abnormal condition of the skin, are on record.

The thickness of the epidermis varies extremely. While upon the cheeks, brow, and eyelids it varies from 1/75 to 1/50 of a line (a line being 1/12 of an inch), on the palm of the hand it ranges from ⅓ to ½ a line, and on the sole of the foot sometimes even exceeds a line. In some parts of the body the horny layer is thicker than the mucous; in others the mucous is the thicker of the two. As the chief use of the epidermis is that of affording protection to the soft and tender subjacent part, it attains its greatest thickness on those portions of the body (the palm of the hand and the sole of the foot) which are most exposed to pressure and friction. The hair and nails belong to the integumentary system, as well as horns in lower animals, and are modifications of epidermis. See INTEGUMENT.

EPIDERMIS. A special superficial layer covering the whole body in higher plants. Among the lowest plants there is no distinct epidermis, a fact related to their simple structure and also to the conditions in which they grow. The epidermis becomes established, as a definite layer of a special character and with special functions, in land plants exposed to the air. Such a layer is a very efficient protection against the excessive loss of water. See BARK; CORTEX; MORPHOLOGY OF PLANTS.

EP'IDID'YMI'TIS. Inflammation of the epididymis, a complexly convoluted tube lying upon the posterior surface of the testicle, and conveying the seminal fluid from it to the *vas deferens*, the proper ejaculatory duct. Epididymitis in the acute form arises commonly from gonorrhœa or, more rarely, from injury. The chronic forms are tubercular or syphilitic. Sterility in the male is a frequent consequence of gonorrhœal epididymitis. The acute form of the affection is very painful and lasts from one to three weeks, with symptoms of swelling, pain, and exquisite tenderness. Treatment consists of rest in bed, support for the affected part, application of soothing lotions, such as lead and opium wash, or ointments containing ichthyol, or poultices. Internally saline purgatives, sedatives for the pain, and specific remedies addressed to the particular form of the disease under treatment are indicated.

EP'IDOTE (from Gk. ἐπί, *epi*, upon + δοτός, *dotos*, given, from διδόναι, *didonai*, to give). A name given to a group of basic orthosilicate minerals that include zoisite, epidote, piedmontite, and allanite. The mineral epidote proper is an aluminium-iron-calcium silicate that crystallizes in the monoclinic system, has a vitreous lustre, and is commonly some shade of pistachio green in color, sometimes shading to brown or nearly black. It is also found massive, fibrous, and granular, and is common in crystalline rocks. Its distribution is world wide, but fine crystals, which may be cut as gems, occur in Norway, Siberia, the Tirol, and in the United States in Haddam, Conn., Chester Co., Pa., at various places in North Carolina, in the Lake Superior region, and in Pike's Peak region, Colo.

EP'IGÆ'A. See Arbutus, Trailing.

EP'IGAS'TRIUM (Neo-Lat., from Gk. *ἐπιγάστριος*, *epigastrios*, over the stomach, from *ἐπί*, *epi*, upon + *γαστήρ*, *gastēr*, stomach). The part of the abdomen (q.v.) which chiefly corresponds to the situation of the stomach, extending from the sternum towards the navel, or umbilicus (q.v.). It is called, in popular language, "the pit of the stomach." See Abdomen.

EPIGEAN (ĕp'ĭ-jē'an) **GERMINATION.** The type of germination in which the cotyledons remain below the surface of the soil.

EP'IGEN'ESIS (Neo-Lat., from Gk. *ἐπί*, *epi*, upon + *γένεσις*, *genesis*, production, from *γίγνεσθαι*, *gignesthai*, to be produced). A special or technical name for the modern conception of the growth and development of the animal organism from the undifferentiated mass of protoplasm constituting the egg. The word is the equivalent of the word "evolution" and is opposed to the preformation views of writers before the time of Harvey, Wolff, and Von Baer, and to somewhat similar views advocated at the present day by Weismann. The older writers, as Bonnet and Haller, used the word "evolution" in the sense that we now employ the term "preformation," or the *emboîtement* theory. See Preformation.

The doctrine of phenomenon of epigenesis is the result of the scientific study of the embryology of animals of all grades from the sponge to man. Before the rise of modern embryology the ablest, most sagacious biologists and philosophers were evolutionists, i.e., preformationists. They knew or recognized only the external signs of the process of development. They witnessed the embryo becoming an adult animal, as a bud develops into a blossom. They knew nothing of the nature of the egg cell, how it became fertilized, subdivided, and how by the multiplication of cells tissues were formed and the different organs of the embryo became developed. They saw the butterfly emerge from the chrysalis, the latter from the caterpillar, and they conceived that the preformed germ of the butterfly and chrysalis and caterpillar existed, in miniature, in the egg laid by the butterfly. Hence they believed that animals in general were a series of cases or wrappings, germ folded within germ, and that the process of birth was a throwing off of these wrappings—a process of evolution.

This ignorance was partially dispelled by Harvey (1651), who maintained that every living being arose from an egg (*Omne vivum ex ovo*). But the founder of embryology was Kaspar F. Wolff, who published his famous *Theoria Generationis* in 1759. He was the first to study the embryology of a vertebrate animal—the barnyard fowl. By means of actual observation of the embryo chick he endeavored to expose the fallacy of the doctrine of preformation, to show that the animal was not fully formed in the germ, but that all development proceeded by new formation, or "epigenesis." He maintained that the embryo consisted of unorganized organic matter, which only gradually became perfected in the course of its development, and that Nature really was able to produce an organism from an undifferentiated material, simply by her inherent forces. Wolff failed to convince his contemporaries, because he could bring only isolated observations and these doubtful of interpretation, and because he was ahead of his time, naturalists then attaching more importance to abstract reasoning than to observation.

The next embryologist to lend, by his observations, support to the views of Wolff was Von Baer in 1829, and after his time the cell theory was formulated, and the epoch-making works of the later embryologists, J. Müller, Rathke, Kölliker, Remak, Bischoff, E. Van Beneden, Kovalevsky, the Hertwig brothers, Weismann (in his earlier works), and many others, gradually built up the modern science of embryology (q.v.) and entirely dispelled the old-time preformation views.

Bibliography. O. Hertwig, *The Biological Problem of To-Day: Preformation or Epigenesis?* (Eng. trans., New York, 1894). Also the works of Haeckel, Nägeli, Strasburger, H. de Vries, His, Roux, Driesch, H. Spencer, Whitman, Wilson, and other authorities under Embryology.

EP'IGLOT'TIS. See Larynx.

EPIG'ONI (Lat., from Gk. *ἐπίγονος*, *epigonos*, descendant, from *ἐπί*, *epi*, upon, after + *γόνος*, *gonos*, offspring, from *γίγνεσθαι*, *gignesthai*, to become). In Greek legend, a name applied to the descendants of the seven chiefs who attacked Thebes in the war between Eteocles (q.v.) and Polynices. After the disastrous defeat of this expedition and death of all the leaders except Adrastus, a second war was undertaken by the children of the fallen chiefs, and this is known as the "war of the Epigoni." It seems that the story was told in two forms in the early epic, for two lists of names are preserved, agreeing only in six out of eight or nine heroes. The result is said to have been the capture and destruction of Thebes, the death or flight of King Laodamas, son of Eteocles, and the establishment of Thersander, son of Polynices, on the throne. In literary history the term "epigoni" is sometimes applied to scholars who limit themselves to unfolding the ideas of the great masters of a previous age. See Seven Against Thebes.

EP'IGRAM (Lat. *epigramma*, Gk. *ἐπίγραμμα*, *epigramma*, inscription, from *ἐπί*, *epi*, upon + *γράμμα*, *gramma*, writing, from *γράφειν*, *graphein*, to write). The epigrams of the early Greeks were simply inscriptions on tombs, statues, and monuments, written in verse, and marked by brevity and simplicity of style, but having nothing in common with what now passes under the name. It was among the Romans that the epigram first assumed a satirical character. The great masters were Catullus and Martial. In modern times an epigram is understood to be either a very short poem, generally from two to eight lines, containing a witty or ingenious thought expressed in pointed phraseology, and in general reserving the essence of the wit until the close; or a pithy and pointed saying expressed in prose. Epigrams flourished in the period following the revival of learning. John Heywood wrote 600, and almost every Elizabethan versifier tried his hand at them. Later, Pope became the great master. Among the French Clément Marot was one of the first to write epigrams. He was afterward excelled by Boileau, Voltaire, and Piron. Epigrams in German are for the most part happily expressed moral proverbs, but the *Xenien* of Schiller and Goethe contain not a few sharp and biting verses of a satirical character. In English the art of epigram, after having been practiced by Byron and Moore, fell into disuse, until revived by William Watson in his *Epigrams of Art, Life, and Nature* (Liverpool, 1884). Consult: Booth, *Epigrams, Ancient and Modern* (2d ed., London, 1865); Dodd, *Epigrammatists of Mediæval and Modern Times* (2d ed., ib., 1875); Adams, *Book of Epigrams* (ib., 1890).

EPIG'RAPHY. See INSCRIPTIONS.

EPIGYNY, ĕ-pĭj'ĭ-nĭ (from Gk. *ἐπί, epi,* upon + *γυνή, gynē,* woman). In flowers, a condition in which the sepals, petals, and stamens seem to arise from the summit of the ovary. In epigynous flowers the ovary appears just below the "flower," and is often said to be "inferior." Contrasting terms are hypogyny (q.v.) and perigyny. See FLOWER.

EP'ILEP'SY (Lat. *epilepsia,* Gk. *ἐπιληψία, epilēpsia,* epilepsy, from *ἐπιλαμβάνειν, epilambanein,* to seize upon, from *ἐπί, epi,* upon + *λαμβάνειν, lambanein,* to seize). A form of disorder, known also as *morbus sacer, morbus comitialis,* "great disease," *grand mal,* and, more commonly, "the falling sickness." It is characterized by sudden insensibility, generally with convulsive movements of the voluntary muscles, and occasionally arrest of the breathing, owing to spasm of the muscles of respiration and temporary closure of the glottis. (See LARYNX.) Owing to the striking character of the convulsion of epilepsy it was, in ancient times, supposed to be due to the influence of the gods or of evil spirits and was therefore called by the Romans "sacred disease." There are four varieties of this condition: (1) *grand mal;* (2) *petit mal;* (3) psychic epilepsy; (4) Jacksonian epilepsy.

In the ordinary form, or *grand mal,* the patient is seized with insensibility, often so complete and sudden as to lead to serious bodily injuries; in the most aggravated cases he has no premonitory sensations whatever, but falls down without any attempt to save himself, and usually with a wild inarticulate cry, immediately after which the face is violently distorted, the head drawn towards one or other shoulder, and the whole body convulsed. These convulsions follow in rapid succession for a few minutes, and are attended by foaming at the mouth and by great lividity, or, in some cases, pallor, which, with the regular spasmodic movements of the lips, nostrils, and eyes, almost invariably lead the bystanders to an exaggerated idea of the immediate danger of the fit. The immediate danger is, in reality, not great, excepting that the sudden attack may lead to an injurious or fatal fall: the tongue, however, may be bitten, or the patient may be so placed as to injure himself seriously by the repeated and unconscious movements of his body, or he may suffocate himself by accidentally falling with his face in water, or otherwise closing up the mouth and nostrils, or by dragging upon a tightened neckcloth. Care should always be taken to avoid these accidents by keeping the epileptic as much as possible within view of persons acquainted with his condition and able to give such assistance as may be required, and the patient himself should avoid places in which a fall would be dangerous. Any attempt to rouse the patient by violent stimuli, or by administering medicines hastily recommended, is almost certain to do more harm than good. The patient should, if possible, be placed on a mattress or other soft place near the ground; his clothing loosened round the chest, the head a little raised, and a free circulation of air maintained. The ordinary course of the fit (which may last from 5 to 20 minutes altogether) is as follows: the convulsions gradually diminish in intensity, and the patient passes into a state of deep but motionless stupor, with dilated pupils, and sometimes, but not always, with snoring or noisy breathing; the foaming at the mouth ceases, the color gradually returns, and this state leads to recovery through a more or less protracted but apparently natural sleep, the patient, on awakening, feeling fatigued or tender in the muscles which have been convulsed. The sensations which precede the fit—the *aura epileptica*—resemble a current of cold air passing over the body and proceed from the extremities towards the head. In some cases the aura consists of noise in the ears, or a black cloud appearing above the head, or a feeling of nausea or faintness, or loss of breath. In some, the premonitory symptoms allow of time enough for the patient to lie or sit down and thus avoid falling. In most cases a peculiar inspiratory noise or a moan or scream is emitted, called the epileptic cry, as the fit begins. Not infrequently there is no aura or unusual sensation of any kind, preceding the fit. A tight bandage placed suddenly upon the limb in which the aura begins may cut short the fit, or even prevent it altogether.

In *petit mal* the loss of consciousness lasts two or three seconds, and the patient does not fall, but simply suspends operations, stares fixedly before him, gasps, and resumes consciousness, generally without knowing that he has experienced the attack. No treatment is necessary during the attack.

In *psychic epilepsy* there are the usual premonitory conditions noticed. After a period of despondency, irritability, restlessness, dread, giddiness, or, in some patients, intense elation, in others an exhibition of voracious appetite, instead of a fit the patient experiences a sudden attack of laughing, weeping, or shouting, with extravagant gesture and maniacal appearance, and even in some examples with uncontrollable homicidal impulse devoid of motive. This is the "psychic equivalent."

In *Jacksonian epilepsy* there is no loss of consciousness; the spasmodic movements are confined to a limited area or to one extremity. It is generally due to tumor of, or pressure upon, the brain in the motor area which controls the part convulsed; it may be due to abscess of the brain, injury, or meningitis.

The ultimate danger of the disease has little relation to the severity of the individual fits, except in the modified sense explained above; the frequency of the attacks being apparently much more apt than their character to influence the duration of life. Indeed, although epileptics may survive several severe paroxysms at distant intervals and recover in the end completely, it rarely happens that very frequently repeated attacks, especially of the *petit mal,* are unattended by some permanent depreciation of the powers of mind or body. The most frequent of the more serious consequences is insanity (q.v.). Sometimes the development of epileptic insanity is attended by palsy, and other indications of structural disorder of the brain; in other instances no such consequences occur, and the brain after death may be found to have very little tangible disease, or only such disease as is found in numerous other cases of functional derangement. Very often there is loss of memory. Yet history furnishes several examples of epileptics who were men of unusual mental ability and intellectuality, as, e.g., Julius Cæsar,

Petrarch, Peter the Great, Mohammed, and Napoleon. Disorders of the digestion are also not uncommon, and there is frequently a want of tone or vigor in all the bodily functions, which communicates an habitual expression of languor and reserve to the epileptic.

In some case of *grand mal* the patient has a succession of fits, one after another, without regaining consciousness for several hours. This is termed *status epilepticus*, and is a grave condition, as the patient may die in it. After an attack of *grand* or *petit mal* a patient may experience a condition of reduced consciousness, during which he wanders off for a day or a week, entering shops, talking with people, eating in restaurants, and otherwise acting as if conscious; on awakening he forgets entirely all that has happened. Or there may be a postparoxysmal psychic manifestation in which the patient is excited and homicidal.

Masked epilepsy, or *epilepsia larvata*, is the term given to a condition succeeding a minor attack of epilepsy, in which there are random remarks made and automatic acts performed by the stupid and dazed patient. Gowers states that imperfect loss of consciousness with automatic action constitutes the minor seizures in some cases, without any initial epileptic stage. He considers epilepsy as a disease of the gray matter of the brain, most frequently of the cortex, which results in an impairment of the resistance of the nerve cells to the liberation of energy. A sudden and violent liberation of nerve force results in derangement of function and impairment of consciousness. Certain cases undoubtedly depend upon organic disease, as tumors or injuries to the brain and its membranes, more especially near the surface. Local sources of irritation in other parts of the body have acted as reflex exciting causes of epilepsy, and cases are recorded in which the disease has been cured by the amputation of a finger or the division of a nerve. The treatment of epilepsy should consist of alleviation of conditions and depends upon the variety of the disease. Iron, zinc, nitrate of silver, borax, digitalis, antipyrine, the bromides, and many other drugs have been used. Bromides control the fits, while they are used, in almost all cases, but are not curative, and their effect is deteriorating and deplorable. Attention to the digestive tract and prevention of fermentation therein, out-of-door life, proper food, and baths have resulted in recovery in many cases. Recovery may be looked for in 8 or 10 per cent of cases. Any treatment must be prolonged at least two years. Marriages of epileptics should be absolutely forbidden. It is estimated that epilepsy claims 1 in 500 of the population in the United States. No race is free from it. Fully 75 per cent of cases begin before the sixteenth year.

Medico-Legal Importance of Epilepsy. Attacks of psychic epilepsy are of vast medico-legal importance. Epilepsy is common among the criminal class, and the lower type of epileptic is cunning, deceitful, treacherous, and bold. Bevan Lewis calls attention to the fact that leading ideals, delusional or otherwise, prevailing in the preparoxysmal stage, are likely to become operative in conditions of postepileptic automatism and during psychic equivalents. It is a hard task to decide whether an epileptic is accountable and should be punished for crimes committed during a psychical manifestation, equivalent or postepileptic. The epileptic will perform automatically complex acts that have the very appearance of deliberate volition. The discovery of motive in an interparoxysmal complaint or threat is not proof of the responsibility of the patient for crime committed during the attack.

A just disposal will be made of these criminals and of the malingerers for whom their legal advocates enter a plea of transient insanity due to epilepsy, when they are promptly confined in a hospital under the eye of a competent alienist, that their interparoxysmal mental state may be studied, and the preparoxysmal and postparoxysmal stages of subsequent attacks may be observed. Study of the intervallic period will generally prove barren of result; rarely will it afford evidence of a mind governed by delusions. Study of the conditions immediately antecedent and subsequent to the attacks will give evidence as to the presence of genuine automatism, of uncontrollable impulse, or of blind fury operating during reductions in consciousness.

Epilepsy in the Lower Animals. Some of the *lower animals* are subject to epileptic fits. The disease is common in dogs, cats, and highly bred pigs. The creatures writhe with involuntary spasms and are for the time without sight or hearing. Sometimes the muscles of the throat are so involved that fatal suffocation occurs. The attack is generally preceded by dullness and lasts from 10 to 30 minutes. It is generally traceable to torpidity or irregularity of the bowels, worms, debility, or plethora. In dogs it is a frequent sequel to distemper. In cattle it usually occurs in connection with the engorgement of the first or third stomach; they throw themselves violently about, bellowing loudly, but seldom die. It is rare in horses. The treatment consists in freely opening the bowels, removing worms if any are present, with bleeding and spare diet if the patient's condition is high, and generous feeding and tonics where it is low. The best preventives are carefully regulated diet, an occasional laxative, with a course of tonics, and especially of arsenic. Good results may be obtained in the treatment of cattle by giving four drams of bromide of potash three times daily.

Consult: Gowers, *Diseases of the Nervous System* (London, 1904) and *The Borderland of Epilepsy* (ib., 1907); Spratling, *Epilepsy and its Treatment* (Philadelphia, 1904); Turner, *A Study of the Idiopathic Disease* (London, 1907).

EP'ILEP'TIC COL'ONY. An establishment that differs from an asylum or a hospital for epileptic patients, in that it consists not of one building or a group of buildings in which the patients are kept for treatment, but of a large farm, in which groups of epileptics live in cottages or in many segregated buildings, and spend their time in gardens, out of doors, or in workshops, schoolhouses, gymnasia, amusement buildings, and chapels, hospitals, and libraries. The greatest improvement in previously hopeless cases and the largest proportion of cures are secured in the colony system, with little drugging and with natural and hygienic conditions of life. The first epileptic colony, that of Bethel, at Bielefeld, in the Prussian Province of Westphalia, was established with four patients. The celebrated pastor, Friederich von Bodelschwingh, first took charge of it in 1872. It has been marvelously successful. With its officers, physicians, nurses, and employees, and over 1600 epileptics, the colony contains over 3600 persons.

The patients are about equally divided in number between the sexes. About 8 per cent are cured; about 21 per cent are discharged improved; about 21 per cent leave unimproved; about 20 per cent die. About 61 per cent of the cured are under 18 years of age. Only 47 out of over 5000 patients have been turned over to insane asylums.

Several other colonies have been established in Germany; there is one in Zurich, Switzerland; one in Holland; and one was established at La Force, near Lyons, France, by John Bost, a clergyman. At Chalfont St. Peter, England, a farm of 135 acres was purchased in 1893 by the National Society for the Employment of Epileptics, and the first building was opened for patients in August, 1894. There are six houses, with accommodations for 66 men, 24 women, 24 girls, and 24 boys. England's second colony for epileptics was established at Warford, near Alderley, Cheshire, in 1900, upon an estate of 400 acres. Detached buildings capable of holding 24 inmates have been erected.

The Craig Colony of New York, at Sonyea, the most extensive in the United States, was opened Feb. 1, 1896, starting with 1900 acres of well-cultivated fields, orchards, and market gardens, with about 30 buildings already thereon; residences, barns, and shops, the latter used in broom making, canning fruits and vegetables, etc. On the grounds are building-stone quarries, brick-clay deposits, and many acres of standing timber. A saw mill and a flour mill stand on a stream, which divides the tract of land into halves. The property formerly was the site of a settlement of thrifty Shakers. It is the largest in use for this purpose in the world, and is ideal in situation and facilities. An athletic field has been built where the patients engage in bicycling, tennis, baseball, and track sports. There is a military company of boys and young men, with a band of about 20 pieces. Instruction is given in reading, writing, letter composition, language, arithmetic, drawing, kindergarten work, clay modeling, and basket weaving. There is also a class in manual training. A training school for nurses was started in May, 1912. The census, Sept. 30, 1912, was as follows: 745 males, 673 females, total 1418. During the previous fiscal year 130 males and 97 females were admitted; 146 males and 83 females were discharged, transferred, or died; 4 recovered. Only chronic cases are taken. The per capita cost of maintenance has decreased with the increase of population. With an average daily attendance of 1433 in 1911–12, the annual per capita cost was $212.92. The total cost of maintenance was $305,261.17, which was reduced by home production of canned goods, hay, grain, fodder, vegetables, and other products to $272,615.35, and the net per capita cost was $175.79.

The New Jersey State Village for Epileptics, founded 1898 at Skillman, has an area of 779 acres. The Massachusetts Hospital for Epileptics, a colony, was opened in 1898 at Monson (P. O. Palmer) and comprises 658 acres, of which 203 are tilled. It sheltered 900 patients in 1912. A private corporation, known as the Pennsylvania Epileptic Hospital and Colony Farm, established in 1898 a colony of 30 patients at Oakbourne, on a farm of 110 acres. There is also a colony for the feeble minded and epileptic at Spring City, with a population of 600 (males). Texas established a colony for epileptics near Abilene in 1904.

Several other States have established farm colonies for epileptics. Michigan has a Home for feeble minded and epileptics at Lapeer, sheltering 306 persons. The Indiana Village for Epileptics is situated at Newcastle, and has a capacity of 116. The Virginia State Epileptic Colony houses 100 patients, all males.

EP'ILO'BIUM (Neo-Lat., from Gk. ἐπί, *epi*, upon + λοβός, *lobos*, lobe, pod). A genus of plants of the family Onagraceæ. The species are herbaceous perennials, natives of temperate and cold countries, and very widely diffused in both the Northern and the Southern Hemispheres. The fireweed (*Epilobium angustifolium*) is frequently planted in gardens and shrubberies on account of its numerous and beautiful rose-colored flowers. It is called fireweed, from its very early and common occurrence in tracts that have been recently burned over. It is found in very northern regions. The pith, when dried, yields a quantity of sugar to boiling water, and is used in Kamchatka for making a kind of ale. *Epilobium hirsutum*, a European species frequently cultivated as an ornamental, has escaped and become established in many parts of the United States. It has showy magenta-colored petals and is very attractive.

EP'ILOGUE (Lat. *epilogus*, Gk. ἐπίλογος, conclusion, from ἐπιλέγειν, *epilegein*, to say in addition, from ἐπί, *epi*, upon + λέγειν, *legein*, to say). In oratory, the summing up or conclusion of a discourse; in a drama, the short speech in prose or verse which frequently, in former times, was subjoined to plays, especially to comedies.

EPIMENIDES, ĕp'ĭ-mĕn'ĭ-dēz (Lat., from Gk. Ἐπιμενίδης). A Greek priest of Crete, said to have come to Athens about 600 B.C., and to have purified the city from the guilt contracted by putting to death the adherents of Cylon (q.v.). The personality of Epimenides early became hidden under a mass of legend, as in the case of other prophets of new religious revelations in the seventh and sixth centuries B.C., when the Orphic movement (see ORPHEUS) was at its height, and to him was attached the common folk tale of a prolonged sleep. To him are attributed the lines cited by St. Paul (Titus i. 12): "The Cretans are always liars, evil beasts, idle gluttons." He is also said to have written a poem on the voyage of the Argonauts, to have composed numerous oracles, and to have written prose works on purificatory rites. Consult: Schultess, *De Epimenide Cretensi* (Göttingen, 1877); Loeschcke, *Die Enneakrunos-Episode bei Pausanias* (Dorpat, 1883); Toepfer, *Attische Genealogie* (Berlin, 1889); Kern, *De Orphei, Epimenidis, Pherecydis Theogoniis* (ib., 1888); Diels, *Epimenides von Kreta* (Sitzungsberichte der Berliner Akademie, 1891); Rohde, *Psyche* (Freiburg, 1890–94); Demoulin, *Epiménide de Crète* (Brussels, 1901); Diels, *Die Fragmente der Vorsokratiker*, 2d ed. (2 vols., Berlin, 1906–10).

EPIME'THEUS (Lat., from Gk. Ἐπιμηθεύς, afterthought). The son of Iapetus and Clymene, brother of Prometheus and husband of Pandora, by whom he was father of Pyrrha, the wife of Deucalion. See PROMETHEUS.

ÉPINAL, ā'pē'nȧl'. The capital of the Department of Vosges, France, situated at the western base of the Vosges Mountains, 1070 feet above sea level, on both banks of the Moselle, 264 miles by rail east-southeast of Paris (Map: Northern France, M 4). It is a well-built, handsome town, with clean and regular streets, a number of public squares, a hospital, a college, and a library containing 30,000 valuable old volumes and 218 manuscripts. The departmental museum contains several collections of antiquities and a fine picture gallery. Among the chief buildings are the parish church, an antique Gothic structure; the barracks, and the residence of the prefect of the department. Its fort forms, with Belfort, Dijon, and Besançon, a line along the Moselle. This modern fortress, constructed since 1870, is considered one of the most important defensive works of France. There are ruins of an old castle and of ramparts of the thirteenth century. A monument commemorates the victims of the war of 1870–71, when the Germans occupied the town after a brief battle. The manufactured products of Epinal include cotton fabrics, print goods, embroidery, hats, starch, needles, wrought iron, pottery, cutlery, paper, and leather, and the town has some trade in grain, wine, and timber. Pop. (commune), 1901, 28,080; 1911, 30,042.

ÉPINAL GLOSSARY. A glossary of Anglo-Saxon and Old Saxon, ascribed to the end of the seventh century, and so called because preserved at Epinal, France. A facsimile has been published by Sweet (London, 1883).

EP'INASTY (from Gk. *ἐπί*, *epi*, upon + *ναστός*, *nastos*, closely packed, from *νάσσειν*, *nassein*, to press close). In plants, the more rapid growth of a dorsiventral organ upon its upper side, causing the organ to bend downward or to be pressed close to the earth. This may be brought about by various external causes, or by unknown internal causes. See Growth; Hyponasty.

ÉPINAY, ā'pē'nā', Louise Florence Pétronille Tardieu d'Esclavelles de la Live d' (1726–83). The friend of noted literary men, among them Diderot, D'Alembert, and Holbach, her relations with Rousseau and F. M. Grimm were more intimate still. After a formal separation from her husband, she retired to her Château de la Chevrette, in the valley of Montmorency, where she played hostess to some of the most famous men of her day, especially to Rousseau, who spent a year (1756–57) in one of the outlying cottages—since famous as the "Hermitage." There, with the help of Diderot, she conducted acceptably Grimm's famous *Correspondence with European Courts*. She wrote *Les conversations d'Emilie* (1774), a complement to Rousseau's *Emile*, designed for the education of her granddaughter, later crowned by the Academy, and *Mémoires et correspondance* (3 vols., 1818), which were translated in London by J. H. Freese (1899). Consult: Perey et Maugras, *La jeunesse de Madame d'Epinay* (Paris, 1882), and *Les dernières années de Madame d'Epinay* (ib., 1883); H. Beaune, *Scènes de la vie privée au XVIIIe siècle: Madame d'Epinay et ses amis* (Mémoires de l'Académie de Lyon, 1903).

EP'IOR'NIS. See Æpyornis.

EP'IPHA'NIUS (Lat., from Gk. *'Επιφάνιος*, *Epiphanios*), Saint (c.315–403). A Christian bishop and writer. He was born of Jewish parents in Besanduke, a village near Eleutheropolis, Judea, about 315. He may have been educated among the Egyptian hermits. On his return home at the age of 20 he established a monastery and became its head. He was ordained a priest and rose to the rank of Bishop of Constantia (formerly Salamis) in Cyprus, and continued in that office from 367 till his death, in 403. His monastic zeal covered the island with monasteries and his polemical talents were conspicuously manifested against Origen (q.v.). Among his writings the most important are the *Ancoratus*, a polemic against Origen; the *Anacephalæosis*, summaries of theology and ritual; and the *Panarion*, or catalogue of all heresies (80 in number). As an historian Epiphanius was credulous and one-sided. His life is in Jerome's *De Viris Illustribus*. His works are in Migne, *Patrol. Græca*, xli–xliii, and have also been edited by Dindorf (Leipzig, 1859–62). The *Panarion* is separately edited by F. Oehler (Berlin, 1859–61); the *Ancoratus* and *Anacephalæosis* are in German translation in the Kempten library of the Fathers. Consult Lipsius, *Zur Quellenkritik des Epiphanius* (Vienna, 1865).

EPIPH'ANY (Lat. *epiphania*, from Gk. *ἐπιφάνεια*, *epiphaneia*, appearance, from *ἐπιφανής*, *epiphanēs*, evident, from *ἐπιφαίνειν*, *epiphainein*, to appear, from *ἐπί*, *epi*, upon + *φαίνειν*, *phainein*, to be evident, Skt. *bhān*, to shine, OIr. *bán*, white). A festival held on the 6th of January by the Roman Catholic, Eastern, and Anglican churches in commemoration of the manifestation of Christ. Three different events are included in this celebration. As early as the third century at least it was observed as the commemoration of the baptism of Christ and His revelation to the world as the Son of God. This seems to have been the original use of the feast. Later, in the East it was also taken to commemorate the manifestation of divine power in Christ's first miracle at Cana in Galilee. In the Western church the adoration of the Magi was principally put forward, the baptism being specially mentioned in the service for the octave, and the miracle of Cana on the succeeding Sunday. In the fourth century the birth of Christ was also connected with it by some writers. In both East and West the Epiphany has always been a festival of the highest rank, and in the Eastern church the privilege still remains of dispensation from abstinence should the day fall on a Friday, which in the Roman Catholic church is now confined to Christmas. Many special observances are or have been connected with the day, which, under the name of Twelfth Day, Twelfth Night, was a time of special merrymaking in England and closed the Christmas festivities. By provision of the Council of Nicæa the date of Easter for the year (then computed at Alexandria) was, and still is in the Roman Catholic church, solemnly announced to the faithful on this day. In many places the blessing of water (frequently in rivers), and in some of houses, takes place on this day. Sovereigns commonly offered gold, frankincense, and myrrh at the altar—a custom which was still maintained at the French court in the fourteenth century, and which the King of England observes to this day in the Chapel Royal, St. James's. Dramatic representations of the events commemorated took place in churches during mass; some remains of these, performed in private houses, still linger in South Germany and Tirol. For other popular observances, see Befana; Bean King's Festival. For English popular customs, see Chambers, *Book of Days* (London, 1863–64). For the history of the festival, see Kellner, *Hertologie* (Freiburg, 1906).

EP'IPHE'GUS. See Cancer Root.

EPIPH'YSIS. See Pineal Body.

EPʹIPHYTE (Neo-Lat., from Gk. ἐπί, *epi*, upon + φυτόν, *phyton*, plant, from φύειν, *phyein*, to produce). A plant which is mechanically, but not physiologically, attached to another plant. Such a plant derives its food chiefly from the air, getting no parasitic nutrition from the plant on which it grows, and hence it is often called an air plant. Epiphytes are peculiarly characteristic of the tropical evergreen forests. Certain families, particularly ferns, orchids, and bromelias, are rich in epiphytic forms, and many tree trunks in the tropics are covered with a luxuriant growth of vegetation; even the leaves are sometimes clothed with lichens. In the temperate and cold regions of the globe epiphytes are for the most part restricted to lower forms of plant life that are able to endure cold or drought without injury, especially mosses, lichens, liverworts, and some forms of algæ.

The adaptations of tropical epiphytes are among the most striking of the plant kingdom. There are all degrees of epiphytism, as there are of parasitism, and Schimper has named the various types as follows: "Protoëpiphytes" are but little different from soil plants; in fact, they represent soil plants that are often found growing on trees. "Hemiëpiphytes" are plants which are at first true epiphytes, but which later send down soil roots and become soil plants (like some species of *Ficus*). "Nest epiphytes" are those which gather humus and water in various ways. "Cistern epiphytes," of which the bromelias are the type, are the most complete epiphytes of all, the roots being merely holdfast organs, so that all absorption is through the leaves. Many forms, especially the orchids, have well-developed storage organs, consisting of the swollen stems. Indeed, not alone in these storage organs, but also in the thick skins and in the stomatal adaptations, do epiphytes resemble xerophytes (q.v.) in structure. The illustrations on the Plate of ORCHIDS give a good idea of the character of epiphytic growths. In each case a branch has become the home of a varied growth without in any way contributing to the food of these plants or suffering from their presence. See ORCHID.

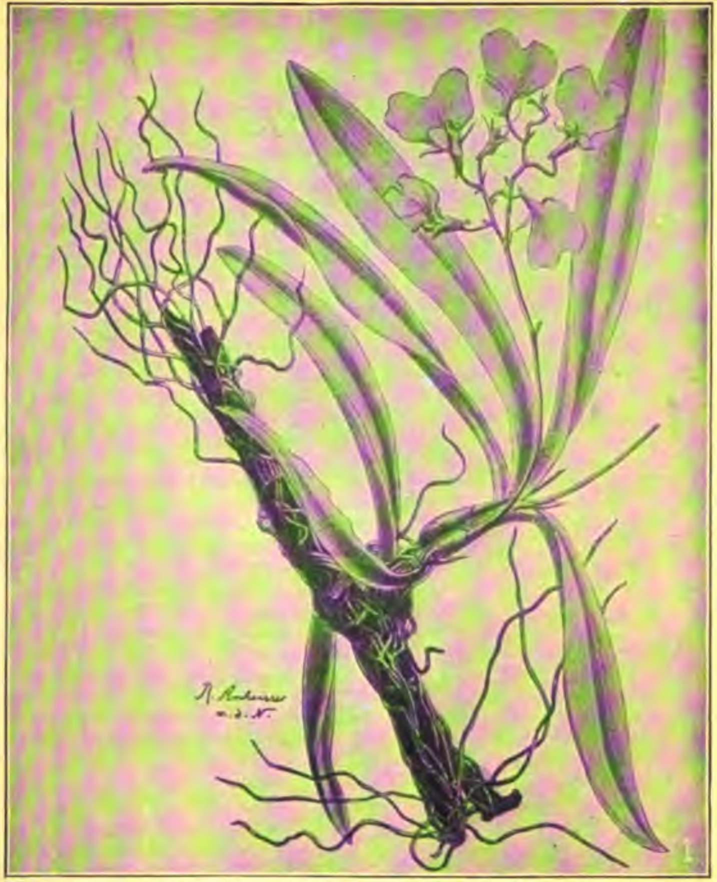
EPIʹRUS (Lat., from Gk. ἤπειρος, *ēpeiros*, mainland). 1. The ancient name of the northwesternmost division of Greece. It was bounded on the east by Thessaly, on the south by the Ambracian Gulf and Ætolia, on the west by the Ionian Sea, and on the north by Illyria and Macedonia. On the eastern border was the mountain range called Pindus (q.v.). The chief town was Dodona (q.v.), situated in the only fruitful and well-watered plain, called Hellopia (now Janina). The rivers Acheron, Oropus, Aracthus, and others rise mostly in the Pindus Range and flow through rocky valleys. Anciently Epirus was celebrated for its cattle and horses and for its breed of Molossian dogs. The region was inhabited by a number of tribes, generally believed by the Greeks not to be of pure Hellenic blood. The Greeks first came in contact with the chief coast tribes, the Thesprotians on the south and the Chaonians on the north. The third great tribe, the Molossians, in the interior, seem to have been but little touched by Greek influence before 400 B.C. About the beginning of the third century B.C., however, their King, Pyrrhus (q.v.), one of the most powerful princes of his time, succeeded in uniting Epirus under his rule. After his death a revolution occurred, which was followed about 230 B.C. by the formation of a league, which lasted until 168 B.C. Epirus was thenceforth for a time ruled by an elective officer, chosen by an assembly of all the Epirotes, held at a town called Passarion. In 168 the Romans, having conquered Macedonia by defeating King Perseus, ravaged Epirus, which had joined Perseus, destroyed its 70 towns, and united it to their empire. From the close of the fourth century A.D. Epirus formed part of the Byzantine Empire until 1204, when one of the Comneni (see COMNENUS) made himself independent. His dynasty ruled the country until 1318. After this, confusion and disorder filled the land until it was seized by the Turks in 1430. For a time it was in the power of Scanderbeg (q.v.), King of Albania, but later it fell again into the hands of the Turks. The region has been peopled largely since the fourteenth century by Albanians. (See ALBANIA.) It now forms part of the Turkish Vilayet of Janina. The district east of the river Arta was ceded to Greece in 1881. Consult: Leake, *Travels in Northern Greece* (London, 1835); Philippson, *Thessalien und Epirus* (Berlin, 1897); Nilsson, *Studien zur Geschichte der alten Epirus* (Würzburg, 1909).

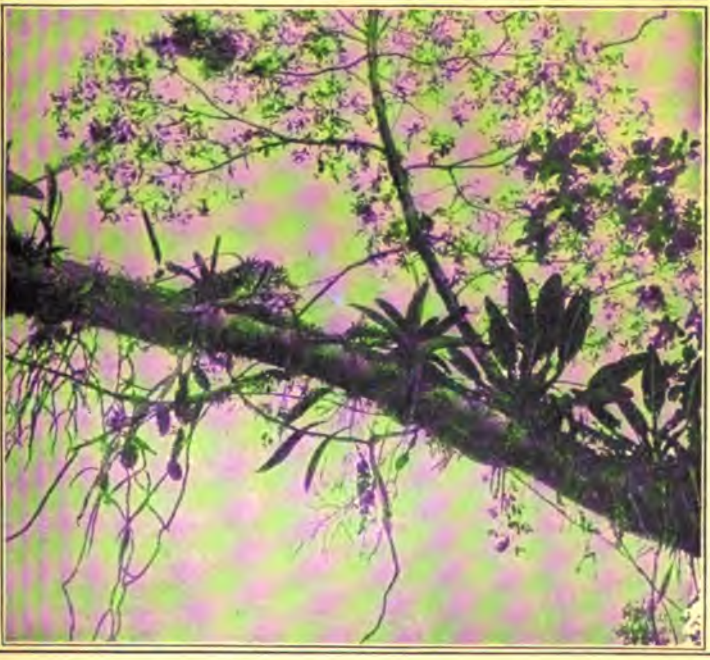
2. An administrative province of Greece, formed out of the northwest section of territory acquired by that country after the Balkan campaigns of 1912–13. Pop. (est.), 650,000. It is bordered on the north by Albania and on the east by the provinces of Macedonia and Thessaly (Map: Greece, B 2). The Gulf of Arta and the Ionian Sea form its southern and western boundaries respectively. Its capital is Janina, with a population of about 25,000. The chief products of the province consist of tobacco, wheat, and olives. Asphalt deposits are known between the town of Praga and the river Arta.

EPISʹCOPACY. See BISHOP; ORDERS, HOLY.

EPISʹCOPAL CHURCH. The body legally known as the Protestant Episcopal Church in the United States of America: the legitimate and lineal descendant in that country of the Church of England. It dates as a separate American ecclesiastical body from 1789, in which year it adopted its constitution, in the same city and in the same hall which had witnessed the framing of the Constitution of the United States of America two years before.

The elements from which this organization grew were the Church of England parishes which had existed in the Colonies from the settlement of the country down to the War of the Revolution. These had all been under the nominal jurisdiction of the Bishop of London, who, however, never visited them and furnished them with no adequate disciplinary oversight. They had, in consequence, grown up without much knowledge of each other and with somewhat different ecclesiastical traditions. In the South generally the English church was in a measure established by the government. In Virginia this was so from the beginning; in Maryland it became so at an early period, though at first, under Lord Baltimore, there had been complete religious toleration; in the Carolinas and Georgia there was a precedence and leadership which came from the countenance and assistance of the mother church in England. Gaining strength from these conditions, the Episcopal churches of the Southern Colonies relied not so much on their inner principles as





1. JONOPUS, species.
2. FROM RIGHT TO LEFT: above, Philodendron cannifolium; beneath, Codonanthe Devosii; above (tree-like) Ficus species; Vriesea; beneath, Anthurium species; Rhipsalis, two species.

(After Schimper.)

on their outward privileges. Discipline became very lax, and the temper was Erastian. The distinctive ecclesiastical and theological notes of Anglicanism were not emphasized. The Colonial churches of Virginia, Maryland, and South Carolina came up to the General Conventions of 1785 and 1789 with a somewhat languid zeal and a disposition to minimize rather than enlarge and strengthen the essential and special features of episcopal government.

In New England and the Middle States the tone and temper were different. There was not even a quasi-establishment of the English church in either. In Massachusetts it had come in as it were at the point of the bayonet. Andros, the first royal Governor of the Colony, brought it with him into a community which both disliked and dreaded it—disliked what was considered its lax discipline and dreaded the ecclesiastical tyranny from which the colonists had suffered in the mother country and from which they had escaped in coming to America. In the midst of a community thus minded, the English church assumed a rigid attitude, both defensive of its rights and somewhat denunciatory in its criticism of its despisers. The churchmanship of its adherents was high and dry, and their political creed was Toryism. Very generally Northern churchmen took the side of the English government in the Revolution, in contrast with the attitude of the Southern churchmen, which was largely patriotic.

In Connecticut the English church was not introduced from without, but came into existence by a spontaneous movement from within. In 1722 the Rev. Timothy Cutler, rector of Yale College, and Mr. Daniel Brown, his assistant instructor, together with two noted Congregational clergymen, Rev. Samuel Johnson and Rev. James Wetmore, left the Congregational ministry, went abroad, and were ordained in London. The conspicuous position of these men drew universal attention to their act, which gave rise to a spontaneous movement in the Colony towards the Episcopal regimen. The church thus produced was very strong in its attachment to its doctrinal and practical system. Not so much, as in Massachusetts, from hatred of dissenters, but rather out of deep love for their own system and sincere conviction of its obligation, Connecticut churchmen became the most conservative of all the elements which entered into the national body. In the remaining portion of New England, as at Portsmouth and Claremont in New Hampshire, at Portland and Gardiner in Maine, and at Narragansett, Newport, Bristol, and Providence in Rhode Island, there were a few churches, but, owing to the ravages of the war, there were in all New England outside of Connecticut only six Episcopal ministers at the close of the Revolution. The few remaining effective parishes were not of a rigorous type and were generally characterized by a sense of the propriety of worship in the use of the liturgy rather than by a hearty zeal for the principles and purposes of an episcopal government.

In the Middle States there were other differences. The English church was introduced into New York, New Jersey, Pennsylvania, and Delaware about the same time, but in different ways. In New York it found a footing in 1664, when the English wrested New Amsterdam from the Dutch, but it was not until 1693, under an Act of Assembly procured by Governor Fletcher, that it began to grow and became a quasi-establishment. Its temper was kindly towards the Dutch church, which it supplanted as the ruling ecclesiastical influence, but it was stanch in its advocacy of Episcopal principles. In New Jersey the first traces of the church are found in 1700. But it was in 1702 that two agents of the London Society for the Propagation of the Gospel in Foreign Parts, Keith and Talbot, visited the Colony, where as yet no Episcopal church existed. They were very earnest and energetic, and the corner stone of St. Mary's Church at Burlington was laid in 1703. The church from this time was widely disseminated through the province and maintained a character of steadfast adherence to the traditions of the Church of England. In Pennsylvania the English church was not introduced by foreign officials, as in New York, nor by foreign missionaries as in New Jersey, but arose from a demand of the inhabitants themselves, holding an analogous position to that of Connecticut in relation to Massachusetts and Rhode Island. The charter granted to William Penn, sole proprietor of Pennsylvania and Delaware, stipulated that "on the petitions of 20 persons, a preacher or preachers might be sent out for their instruction and should be permitted to reside in the Province without any denials or molestation whatever." According to this proviso the first church building, the precursor of Christ Church, was erected in Philadelphia in 1685, and George Keith, a seceder from the Quakers, became the first traveling missionary of the S. P. G. in 1702. But before Keith's coming, in the latter part of 1701, the society, in answer to a lawful petition of sufficient citizens, according to the charter, had sent the first settled missionary, Rev. Evan Evans, a strenuous man who, before Keith's arrival, had baptized over 500 adults and children of Quaker families, thus making evident a legitimate demand for the Episcopal church.

The movement to constitute one Episcopal church for the whole United States began on May 11, 1784, at New Brunswick, N. J. Clergymen from New York, New Jersey, and Pennsylvania had gathered there by appointment in the interests of the Corporation for the Relief of the Widows and Orphans of the Clergy. But their minds were charged with larger interests than the resuscitation of this benevolent corporation. They began at once to discuss the principles of a national ecclesiastical union. A committee of correspondence was appointed "for the purpose of forming a continental representation of the Episcopal church and for the better management of the concerns of said church." It was resolved also to call a meeting, as generally representative as possible of the clergy and laity of the different States, in the city of New York, on October 6 of the same year.

Eight States were represented at this meeting, but some of the delegates had not been regularly appointed, and those who were had only received authority to propose and deliberate. The convention, however, signed a declaration of "Fundamental Principles of an Ecclesiastical Constitution," and appointed September 27 of the following year (1785) as the date of a general convention to discuss their proposals, which advocated "one general Episcopal church for the United States, to be constitutionally governed by representatives, clerical and lay, from the church in each State." It was further resolved "That this church embody the doctrine and adopt the liturgy of the English church, so far as consistent with the changed political condition," and "That bishops be recognized as ex officio members of the General Convention, and that the concurrence of clergy and laity be essential for the validity of all measures."

This was a bold anticipation of a future which was uncertain at the time of its formulation. The clergy of Connecticut had elected the Rev. Samuel Seabury as their first Bishop, and he had already made an attempt to secure consecration from the Church of England, which had failed through political obstacles which stood in the way of free action on the part of an established church. In the event, after waiting 16 months, he proceeded to Scotland and there (on Nov. 14, 1784) was finally consecrated by three bishops of the Scottish Episcopal church, who were not hampered by any connection with the state. Thus was ended the anomalous condition which had so hampered the Colonial churches, by obliging their candidates for ordination to take the long and perilous sea voyage in order to receive the episcopal laying on of hands.

The first authorized General Convention was held in Christ Church, Philadelphia, Sept. 27, 1785. After it had been called, the churches in the separate States had met in convention, organized their dioceses, and appointed their delegates. Bishop Seabury was invited to attend, but his dissent from several of the fundamental principles kept him away, and with him all the delegates from New England absented themselves. However, of the 13 States, seven (including all the Middle and Southern States, except Georgia) were represented by 16 clergymen and 24 laymen. The fundamental principles formulated in 1784 were adopted with some slight modifications. In accordance with them, the "General Ecclesiastical Constitution of the Protestant Episcopal Church in America" was completed, which was to be presented to the churches in the various dioceses and ratified by the General Convention in 1789. It contained the general provisions already expressed and was firm in its maintenance of lay representation in the legislature of the church. The committee which drafted the constitution was empowered to make necessary liturgical alterations in the Prayer Book and to prepare a plan for obtaining the consecration of more bishops. The Convention then adjourned, to await the reply of the English bishops, and to meet again in Philadelphia, June 20, 1786. The answer of the English bishops, which arrived in May, indicated that they would gladly comply with the request to consecrate bishops for America, could they be assured of the doctrinal and disciplinary soundness of the constitution and liturgy of the Protestant Episcopal church. A reply was sent, acknowledging the reasonableness of hesitation on their part and furnishing copies of the ecclesiastical constitution and the Proposed Book, as evidences of the soundness of the American church in doctrine, discipline, and worship. The English bishops expressed dissatisfaction with the liturgical changes of the Proposed Book, insisting only on the restoration of the Apostles' Creed in its integrity, yet urging a retention of the Nicene and Athanasian creeds, even if the use of them were merely optional. Before an answer to this could be sent, another communication came from the Archbishop of Canterbury, inclosing the Act of Parliament authorizing the consecration of bishops for America and announcing that only three bishops would be consecrated.

The Convention of 1785, already twice adjourned, met again at Wilmington, Del., Oct. 10, 1786, and consented to restore the Apostles' Creed in its integrity, introduced the Nicene Creed into optional use, but declined even to insert the Athanasian Creed. Other changes of legislation, not very essential, commended by the English bishops, had either been already accomplished or were now conceded. It was found that three bishops had already been elected by their respective diocesan conventions—Dr. Samuel Provoost of New York, Dr. William White of Pennsylvania, and Dr. David Griffith of Virginia. Their testimonials were signed by the Convention, and two of them, Drs. White and Provoost, were consecrated in the chapel of Lambeth Palace on Feb. 4, 1787.

The General Convention of 1789 met in Philadelphia, to ratify the constitution, establish the Prayer Book, and enact necessary canons. It was of the utmost importance that there should be unity of the Episcopal church throughout the length and breadth of the land. The times were more favorable than before for this consummation. The national spirit had been attuned to unity by the ratification of the constitution and the election and inauguration of Washington three months earlier. The ecclesiastical spirit had been so far modified since 1785, by correspondence and consideration, that the Convention at once formally affirmed the validity of Bishop Seabury's consecration and enacted 10 canons, which showed increased and marked respect for the episcopal office. They adopted the constitution with such alterations as allowed representation of a church by clerical members only and provided for a separate House of Bishops when there should be three of that order.

On August 8 the Convention took a recess, during which Bishop Seabury and the New England churches concluded, in view of its action, to join it; and when it reassembled, on September 30, it represented the whole church in all its orders. A Prayer Book was adopted—not the Proposed Book, which had cost so much labor, but a simple adjustment of the English Prayer Book to American conditions, with certain verbal omissions and rubrical emendations, which, however, left it essentially the same book. (See PRAYER BOOK, COMMON.) The Communion Office, in accordance with the wishes of Bishop Seabury, was perfected by closer adherence to the Scottish, and therefore to the Eastern, liturgies. The Convention adjourned October 16, leaving the Protestant Episcopal church fully organized.

For 20 years its energy seemed to have been exhausted by its organization. It was unpopular, as being identified with the English church. It was not alert in action. Its worship was regarded as formal, its discipline as lax. The 20 clergymen and 16 laymen of the Convention of 1789 were increased by only five clerical and four lay representatives in 1811: and only once in those 22 years were there as many as five bishops at any General Convention.

From the latter date, however, the church took a vigorous start, whose impulse has been felt ever since. It was due chiefly to three men—Bishops Hobart of New York, Griswold of New England, and Channing Moore of Virginia—who reconstructed the church in their dioceses, both in number and in character. The leaven spread more widely still. In 1817 some of the Western States were organized into dioceses, and in 1820 the church is reported as organized, though not supplied with bishops, in all the original States. The pioneer Bishop of the West was Philander Chase, consecrated in 1819. Two dioceses, Ohio and Illinois, of which he was successively Bishop, and two colleges, Kenyon and Jubilee, founded by him, are his monuments. John Stark Ravenscroft, consecrated Bishop of North Carolina in 1823, did a similar work in the wilder regions of the South, and in seven years changed a diocese of four churches into one of 23.

By the time of Bishop White's death, in 1836, two great changes had begun to be apparent, which were to characterize the next period. One was the crystallization of party spirit, which was destined to give rise to heated controversies. On the one side stood the old Evangelical party, represented by such distinguished men as Bishops Burgess, Eastburn, Chase, Lee, Alonzo Potter, M'Ilvaine, Bedell, and Stevens; by Richard Newton and Alexander H. Vinton and Francis L. Hawks; by Dr. Sparrow of the Virginian Seminary, its most learned theologian, and Stephen H. Tyng, for years its recognized leader. The opposite school, to whose growth a great impetus was given by the Oxford movement across the sea (though the earlier bishops, Seabury and Hobart and Ravenscroft, are to be classed with it), emphasized the objective, the institutional side of religion—a tendency especially natural in a country where the church was left to vindicate and sustain itself without aid or countenance from the state. While for a long time, by a sort of tacit compact, the foreign missionary work was left to the Evangelicals, the home field was cultivated rather by the High Churchmen. The General Theological Seminary (founded in New York in 1817 and molded by Bishop Hobart's influence) inclined its pupils to the views of the latter. Otey and Kemper in the West acted on their principles; Breck and Adams founded their associate mission at Nashotah on them. Bishop George Washington Doane of New Jersey, than whom no one in his day was more instrumental in shaping the history of the church, was the most commanding representative of this school, as Bishop Whittingham of Maryland was its most learned counselor.

The other distinctive feature of the central period of the nineteenth century was the expansion of the church beyond the narrow limits which had at first confined it. The General Convention of 1835 elected the first missionary Bishop so called—Jackson Kemper, who became the apostle of the northwestern territory lying east of the Rocky Mountains, founding and fostering the church in Missouri, Indiana, Iowa, and Minnesota. Such vast and unexplored regions were confined to the charge of single bishops that one of them used playfully to style himself Bishop of All-outdoors; but their labors were so earnest and continuous that it was only a logical consequence of them when, in 1859, the General Convention made the episcopate coextensive with the boundaries of the United States.

The history of the Episcopal church at the time of the Civil War is of special importance because of its bearing on both national and religious reunion after peace had been restored. To the influence which it had acquired by the abstinence of its clergy from political strife, the delay of the actual conflict was largely due; and a strikingly fraternal spirit prevailed in its councils throughout even the height of the bitter struggle. When the General Convention met in New York in 1862, seats were assigned to the Southern bishops and deputies, and their names were called as usual. The latter had considered themselves forced to outward ecclesiastical separation, but declared that, "though now found within different political boundaries, the church remains substantially one." By the time that the next General Convention met peace had been declared; and so tactfully were the delicate questions of the moment handled that complete reunion was effected with the least possible friction. The whole attitude of the church gained public respect and confidence, and the manner in which it led the way in reunion was of undoubted service to the work of national reconstruction.

After the reunion of churchmen as citizens had been thus happily accomplished, they were for a while divided in spirit by fierce theological controversies. A determined attempt was made to suppress the outward developments of what is known as ritualism, especially in the General Conventions of 1868, 1871, and 1874. The opposing parties valued or condemned these external manifestations, not for their own sake, but because of the doctrines they were supposed to symbolize, which were held by their opponents to be practically those of the Roman Catholic church. In spite of the eloquent arguments of the leader of the High Church forces, the distinguished warden of Racine College, James De Koven, a canon which marks the height of the movement in favor of repression was passed in 1874, limiting the ritual which might be employed in the celebration of the Holy Communion; but it remained practically a dead letter until its repeal in 1904. The question of baptismal regeneration was also productive of heated debate; in 1871, 48 out of 53 bishops issued a declaration that in their opinion "the word regenerate in the offices for the ministration of baptism of infants is not there so used as to determine that a moral change in the subject of baptism is wrought in the sacrament." This failed, however, to satisfy the extreme Low Churchmen, a number of whom withdrew in 1873, under the leadership of Dr. Cummins, then Assistant Bishop of Kentucky, and constituted the Reformed Episcopal church (q.v.).

Partly through the withdrawal of these aggressive elements, and partly through the general drift of opinion in the church, the old Evangelical party, as a party, has had less and less influence in late years. The High Church party, on the other hand, has grown continuously both in numbers and influence; and what were advanced ritualistic practices a generation ago are now placidly accepted by the most moderate churchmen. At the same time the Broad Church school, which was an outcome of the movement of Maurice and Kingsley and Stanley in England, has attained a large and increasing share of power. The two older parties agreed in their insisting on the importance of dogmatic belief, differing only as to which particular set of dogmas were to be emphasized. The new one stands for individual freedom of both thought and action and looks doubtfully upon claims to absolute authority, whether in church or Bible. In its conception of applied Christianity it is largely humanitarian and is forward to provide for the temporal as well as the spiritual needs of men.

By this growing latitude of belief on the one hand, and by its connection with the historic past and its dignified liturgical form of worship on the other, the Episcopal church has in recent years appealed so strongly to numbers of educated men and women as to make natural its consideration of itself as a possible centre and rallying point for the reunion of the widely varying forms of Protestant Christianity in America. This movement really began with the memorial presented to the House of Bishops in 1853 by Dr. Muhlenberg, a man far in advance of his generation in many particulars, which looked to "some ecclesiastical system broader and more comprehensive . . . providing for as much freedom in opinion, discipline, and worship as is compatible with the essential faith and order of the Gospel." This spirit of conciliation found definite expression in the declaration of the House of Bishops in 1886, which was confirmed, with some minor changes, by the Lambeth Conference two years later. It set forth as an irreducible minimum, "as inherent parts of the sacred deposit, and therefore as essential to the restoration of unity among the divided branches of Christendom: (1) the Holy Scriptures of the Old and New Testament as the revealed word of God; (2) the Nicene Creed as the sufficient statement of the Christian faith; (3) the two sacraments—baptism and the supper of the Lord—ministered with unfailing use of Christ's words of institution and of the elements ordained by Him; (4) the historic episcopate locally adapted in the methods of its administration to the varying needs of the nations and peoples called of God into the unity of His Church." This is the "Chicago-Lambeth quadrilateral."

The general position of the Episcopal church is explicitly declared in the preface to the Prayer Book, which states that "this Church is far from intending to depart from the Church of England in any essential point of doctrine, discipline, or worship." Its organization in spiritual matters is substantially the same as that of the mother church, with which it maintains close relations, made more effective by the participation of American bishops in the Lambeth conferences, held approximately every 10 years. (See ANGLICAN COMMUNION; LAMBETH CONFERENCE.) Its constitution, of which a revision, together with a revised body of canons, was adopted in 1904, is in many particulars analogous to that of the nation, except that the powers of its executive head are strictly limited and hardly more than nominal. He is called the Presiding Bishop, and is the senior Bishop in order of consecration. A movement in favor of facilitating the government of the church culminated in 1904, when constitutional provision was made for a division of the country into strictly organized provinces, with a metropolitan see at the head of each, and when eight judicial "departments" for Courts of Review were established by canon.

In legislative matters, for purposes affecting the whole church, the General Convention is supreme. The body, which meets triennially in different places, is composed of two houses, the House of Bishops, consisting of all bishops of the United States and foreign missionary bishops, and the House of Clerical and Lay Deputies, composed of four clergymen and four laymen elected from each diocese; missionary jurisdictions are represented in the House of Deputies by one clergyman and one lay delegate. Legislation, to be effective, must be passed by a concurrence of both houses and, in the lower house, of both orders. At the General Convention held in New York City in October, 1913, provision was made for the further organization under a provincial system according to which the dioceses and missionary jurisdictions in the United States and its colonies are grouped in eight provinces, each to have certain functions as to organization, holding of conventions, and legislation, but in subordination to the general organization. Each diocese holds its own annual convention, composed in most instances of the clergy canonically resident within it, and of lay delegates for each parish, sitting as one house and presided over by the Bishop. The General Convention can make no alteration in the constitution or the Prayer Book until it has been laid over for three years, officially signified to every diocese, and passed again at the subsequent Convention. The diocesan conventions legislate for the internal affairs of each diocese, in harmony with the general canons. Each diocese has also a standing committee, composed of both clergy and laity, which has various administrative functions, and in the case of a vacancy in the see acts as the "ecclesiastical authority" of the diocese; the election of new bishops must be confirmed by a majority as well of the standing committees as of the other bishops of the whole church.

In 1914 there were 67 dioceses and 21 missionary districts (which may be described as embryo dioceses) in the United States and its colonies; also one missionary district in Africa, one in Cuba, one in Mexico, three in China, and two in Japan, besides two bishoprics, not strictly forming a part of the Episcopal church, in Brazil and Haiti. There were also nine organized chaplaincies on the continent of Europe, which minister primarily to Americans. The organized parishes and missions in the United States, including Alaska, Honolulu, the Philippine Islands, and Porto Rico, in 1914 numbered 8326, and the clergy 5715, including 116 diocesan, coadjutor, and missionary bishops. There were 1,004,217 communicants, 51,267 Sunday-school teachers, and 460,091 Sunday-school scholars. During the year 69,639 persons were baptized and 55,771 confirmed. The total contributions for the year amounted to $19,489,309.

As the church has expanded, many new agencies have arisen to foster and extend its exuberant life. Chief among these are 18 sisterhoods (q.v.) in which women are bound together for work and devotion, three religious orders for men, and the revived order of Deaconesses (q.v.); the Domestic and Foreign Missionary Society, to which every baptized member of the church is considered ipso facto to belong; the Brotherhood of St. Andrew (q.v.), which enlists the active work of laymen, and the church clubs, also for laymen, of which there are 24; the Daughters of the King (q.v.), for women; the Church Temperance Society (q.v.); the Parochial Missions Society, and the American Church Sunday School Institute. Church hospitals, begun by Dr. Muhlenberg with St. Luke's in New York and followed by the Episcopal Hospital in Philadelphia, have exemplified the humanitarian side of religion; while schools under religious influence, which owe their inception to the same far-seeing founder, have multiplied throughout the country. Colleges such as those at Hartford, Geneva, Racine, Sewanee, Gambier, and South Bethlehem, provide for higher education. Schools for the training of clergy are maintained in New York City (established 1817); Theological Seminary, Fairfax Co., Va. (1823); Gambier, Ohio (1828); Nashotah, Wis. (1842); Middletown, Conn.; Philadelphia, Pa., (1857); Sewanee, Tenn. (1857); Faribault, Minn. (1858); Geneva, N. Y.; Cambridge, Mass. (1867); Denver, Colo. (1871); Syracuse, N. Y. (1876); Topeka, Kans.; Chicago, Ill (1885); San Mateo, Cal. (1894); Petersburg, Va. (1884), and Washington, D. C. (1891), for colored students; and Tokio, Japan. The principal organs of the church in the press are *The Churchman* (New York), *The Living Church* (Milwaukee), and *The American Catholic* (San Francisco). Other church publications are *The Parish Visitor* (New York), *The Spirit of Missions* (New York), *The Church Militant* (Boston), and *St. Andrew's Cross* (Boston).

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EPISCOPAL CHURCH, Reformed. See Reformed Episcopal Church.

EPISCOPAL THEOLOGICAL SCHOOL. An institution for the education of Episcopal clergymen, situated at Cambridge, Mass. It was founded in 1867 by Benjamin Tyler Reed. The school offers courses leading to the degree of B.D., which is conferred on students holding bachelor's degrees. The principal buildings include the chapel, the deanery, the library, and Reed, Burnham, Lawrence, and Winthrop halls. The students in 1914 numbered 56. The school is affiliated with Harvard University.

EP'ISCO'PIUS (Neo-Lat., from Lat. *episcopus*, Gk. *ἐπίσκοπος*, *episkopos*, bishop; a translation of his Dutch name, *Bisschop*, Bishop), Simon (1583–1643). A Dutch theologian, after the death of Arminius the head of the Arminian party. He was born in Amsterdam, studied at Leyden, took his degree of M.A. in 1606, and was ordained pastor of the village of Bleyswyck near Rotterdam, in 1610. In the following year the States-General, with the intention of putting an end to the agitations created by the controversies between the Gomarists, or Calvinistic party, and the Arminians, or Remonstrants, ordered a conference to be held in their presence at The Hague between six ministers of each party. Episcopius was one of the six charged with the advocacy of Arminianism and highly distinguished himself by his good temper, ability, and learning. In 1612 the curators of the University of Leyden appointed him professor of theology in the place of Gomarus, who had gone to Zeeland; this enraged the leaders of the orthodox party, who unscrupulously accused him of Socinianism. This was one factor in the calling of the Synod of Dort (q.v.), 1618–19. Episcopius was present, along with several other Arminians; but the Calvinists, who were in an overwhelming majority, would not allow him to speak. He was expelled from the church and banished from the country. Episcopius betook himself first to Antwerp and afterward to Rouen and Paris, but in 1626 returned to Rotterdam. In 1634 he was made professor of divinity in the newly established seminary of the Remonstrants in Amsterdam. His works were published in Amsterdam (1650–65). The chief are the *Confessio Remonstrantium* (1621) and the *Apologia pro Confessione* (1629). Consult Calder, *Memoirs of Simon Episcopius* (London, 1838). See Gomarus; Arminius.

EPISTATES, ê-pis'tâ-tēz (Lat., from Gk. *ἐπιστάτης*, commander, president, from *ἐφίστασθαι*, *ephistasthai*, to preside, from *ἐπί*, *epi*, upon, over + *ἱστάναι*, *histanai*, to stand). In general, the title in ancient Greece of any officer in charge of certain functions, but in particular the title of the presiding officer of the two great Athenian councils, the Ecclesia and the Senate of Five Hundred. (See Boule.) The Senate was divided into 10 bodies, representing the 10 tribes, of 50 members each, and each body of 50 acted in turn as a committee of both councils for a period of from 35 to 30 days. The members of this committee were called Prytanes, and every day there was chosen from among their number a single member, called the Epistates of the Prytanes, or briefly the Epistates, to act as chief presiding officer for that day.

EP'ISTAX'IS (Neo-Lat., corrupted from Gk. *ἐπισταγμός*, *epistagmos*, nose-bleed, from *ἐπιστάζειν*, *epistazein*, to bleed at the nose, from *ἐπί*, *epi*, upon + *στάζειν*, *stazein*, to drip). Hemorrhage from the nose, a symptom of various conditions. It occurs in some people frequently after heavy work or exertion causing the heart to beat violently, or during paroxysms of coughing, as in whooping cough. It may be a premonitory symptom of typhoid fever, or it may be a symptom of disease of the heart or kidneys in which the blood vessels are diseased, or during purpura or hæmophilia (q.v.). Menstruation sometimes manifests itself, vicariously, as a nosebleed. It is caused by picking the nose, whereby small ulcerations are produced. If it does not stop through spontaneous clotting in the nostril or after pressure of the wing of the nostril against the septum, it may be necessary to have a physician look into the nostril, find the bleeding point, and apply cotton alone or moistened with adrenalin or tannin or alum to it. In serious cases the nostril must be plugged in front and behind in the throat. In hæmophilia, a disease in which the blood loses its plasticity or clotting power, nosebleed may be fatal. See Bleeding.

EPIS'TEMOL'OGY (from Gk. *ἐπιστήμη*, *epistēmē*, knowledge, from *ἐπίστασθαι*, *epistasthai*, to know + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). A technical term, probably originated by Ferrier, and used in philosophy to designate that branch of inquiry which deals with the origin, validity, and limits of our knowledge. Before we can arrange and classify scientifically the knowledge we have attained, it is necessary, so some have claimed, to have at least a theory to account for our possession of it and to guarantee its value. Epistemology is often differentiated from psychology by its dealing with the validity of knowledge rather than with the analysis of the knowing mind (structural psychology), or with the development of cognition (genetic psychology), or with the part the knowledge plays in life (functional psychology). In recent literature, especially in pragmatic circles, epistemology is used in a dyslogistic sense as applied only to those theories of knowledge which regard knowledge as a thing to be considered in a different way from other subjects of inquiry and which therefore repudiate in this study the methods in vogue in the natural sciences. Such a theory was Kant's, who maintained that there are a priori (q.v.) percepts and concepts, that a careful listing and examination of these are prerequisite to any acceptable metaphysics, and that there can be genuine knowledge, as distinct from disconnected sensations, only when these a priori percepts and concepts have played their part in constructing the object known.

But there is no very good reason to confine the term "epistemology" to just one type of dealing with knowledge. Whether a philosopher regards knowledge as having a transcendental origin or a biological origin, whether he treats knowledge as a thing unique or as an instrument of adjustment when difficulties are met in experience, he has a theory of knowledge or an epistemology. Consult, for the Kantian epistemology, the works referred to under Kant. For more recent views, consult: Dewey, *Studies in Logical Theory* (Chicago, 1903); *The Influence of Darwin on Philosophy* (New York, 1910); James, *Pragmatism* (ib., 1907); *The Meaning of Truth* (ib., 1909); *Essays in Radical Empiricism* (ib., 1912); Bergson, *Creative Evolution* (Eng. trans., ib., 1911); Marvin, in *The New Realism* (ib., 1912). See Knowledge, Theory of; Instrumentalism; Pragmatism.

EPIS'TLE (AS. *epistol*, OF. *epistle*, *epistre*, Fr. *épître*, Lat. *epistola*, from Gk. *ἐπιστολή*, *epistolē*, letter, from *ἐπιστέλλειν*, *epistellein*, to send, from *ἐπί*, *epi*, upon + *στέλλειν*, *stellein*, to send). Properly, a letter; used specially for a letter intended for publication, or which, having been published, belongs to literature. The 21 books of the New Testament immediately following the Book of Acts are called the Epistles, having been originally letters or cast in epistolary form. The first 13, traditionally assigned to St. Paul, used to be called the Apostle. The two epistles to Timothy and that to Titus are called the pastoral Epistles because they treat of the duties of a pastor. The general or catholic Epistles are those of Peter, James, John, and Jude. For discussion of the authorship, date, and other questions connected with these books, see the articles on the separate books.

The lesson in the liturgy which precedes the gospel for the day is called the epistle, because generally taken from the New Testament Epistles; in the Middle Ages, because most of them were taken from St. Paul, it was frequently called the apostle. In the earlier ages it was customary to read two lessons, one from the prophets and one from the Epistles, on feast days. In the modern Roman missal many of the epistles are taken from the Old Testament; on a few days two lessons are still read in this place, on Ember Saturday six, of which the first five are from the Old Testament. St. Jerome is said by the mediæval liturgical writers to have made the selection of the epistles and gospels at the request of Pope Damasus. The epistle was formerly read or sung from the ambo (q.v.); about the end of the Middle Ages it became customary to recite it facing the altar. Being addressed to the faithful, it is read at the south side of the altar, which in mediæval symbolism typifies the quarter of light, while the gospel, preached to the heathen, is read towards the north, the quarter of darkness and evil. Down to the eighth century the *lector*, or reader, was charged with the recitation of the epistle; then it was attributed to the subdeacon, not at first as a function of his office, but as a concession.

EPISTLES, Spurious. See Apocrypha.

EPISTLE SIDE OF THE ALTAR. The left side of the altar or communion table, looking from it, at which in the church service the epistle of the day is read. It is of lesser distinction than the right, or gospel, side and is occupied by the clergymen of lower ecclesiastical rank. In early churches, when in the choir there was an ambo (q.v.) on each side—one for the epistles, the other for the gospels—the term was applied to the choir also.

EPISTLES OF HORACE. A series of poems by Horace, in the form of letters to individuals, published between 20 and 12 B.C. They are a continuation of the *Satires*, but differ from the latter in their more tolerant and philosophical atmosphere, in their better taste, and in literary form. They are arranged in two books, and are in hexameter verse. The *Epistula ad Pisones* is a famous piece of criticism, better known as the *Ars Poetica* (q.v.).

EPIS'TOLÆ OB'SCURO'RUM VIRO'RUM (Lat., Letters of Obscure Men). The title of a collection of satirical letters which appeared at Hagenau in 1515, professing to be issued by the Aldine Press at Venice. It purported to be the composition of certain ecclesiastics and professors in Cologne and other places in Rhenish Germany. The letters were directed against the scholastics and monks and helped in no small degree to bring about the Reformation. The controversy of Reuchlin (q.v.) with the baptized

Jew Pfefferkorn concerning the destruction of the Talmudic books gave the first occasion to the *Epistolæ*, and probably their title was suggested by the letters to himself from distinguished men which Reuchlin published, under the title *Virorum Epistolæ Clarorum ad Reuchlinum Phorcensem* (1514), to show that his position in this controversy was approved by the learned. The *Epistolæ Obscurorum* were addressed to Ortuinus Gratius in Deventer, who had made himself odious to the liberal minds of the time by his arrogant pretension, his determined hostility to the spirit of the age, and his lax morality. On the first appearance of the work it was ascribed to Reuchlin, afterward to Reuchlin, Erasmus, and Hutten. The first part contained 41 letters, a number which was increased in subsequent editions. It was probably mainly the composition of the distinguished humanist Crotus Rubianus, who originated the idea. In the composition of the second part (1519) Ulrich von Hutten had much share, but others participated, including Crotus. The *Epistolæ* were placed in the catalogue of forbidden books by a papal bull. The classical edition is that by Böcking, *Supplementum Ulrici Hutteni Operum*, vols. vi, vii (Leipzig, 1864–70). There is a German translation by Binder (Stuttgart, 1876). Consult: Strauss, *Ulrich von Hutten* (6th ed., Leipzig, 1895), of which there is an English translation (London, 1874); Pattison, *Essays* (Oxford, 1889); Brecht, *Die Verfasser der Epistolæ Obscurorum Virorum* (Strassburg, 1904).

EPIS'TOLER, or EPISTLER. An English term for the clergyman (answering to the subdeacon in the Roman mass) who, in accordance with the twenty-fourth canon of 1603, assists the celebrant in the administration of Holy Communion. The name is derived from the fact that his principal duty is to read the epistle. See GOSPELER.

EPIS'TROPHE. See CHLOROPLAST.

EPIS'TULÆ EX PON'TO (Lat., Letters from Pontus). Four books of letters, written by Ovid from his place of exile on the Black Sea. In them the poet bitterly complains of his dreary life and his separation from his family and appeals frantically to his friends at Rome to intercede for him with the Emperor. As were the *Tristia*, which preceded them, the letters are in the elegiac measure (see DISTICH; ELEGY), but give the names of the persons addressed.

EP'ISTY'LIUM or **EP'ISTYLE** (Lat., from Gk. *ἐπιστύλιον*, *epistylion*, from *ἐπί*, *epi*, upon + *στῦλος*, *stylos*, column). A beam of stone or sometimes of wood, which rests upon the capitals of columns or pillars and spans the space between them. It is synonymous with the more customary term "architrave" (q.v.). See COLUMN.

EP'ITAPH (Lat. *epitaphium*, *epitaphius*, from Gk. *ἐπιτάφιος*, *epitaphios*, funeral, from *ἐπί*, *epi*, upon + *τάφος*, *taphos*, tomb: supply λόγος, *logos*, word, utterance). Properly a brief commemorative inscription on a tomb or other monument over a grave. The oldest inscriptions of this kind are inscriptions on ancient Egyptian sarcophagi. These epitaphs all contain simply a statement of the name, family, and condition of the deceased, with a prayer to some deity, generally Osiris or Anubis. The earliest Greek epitaphs are from the island of Thera and date from a time as early at least as the seventh century B.C. They contain simply the name of the deceased. The earliest Athenian epitaphs are also very short, containing hardly more than the name of the deceased, together with that of the deceased's father, and are often written in verse, generally in an elegiac distich. The Greek epitaphs from later times are often of considerable length and are very various in character; they are frequently, also, in the form of the epigram. Roman epitaphs were much more meagre than the later Greek epitaphs. On the Roman urns are the letters D. M. or D. M. S. (*Diis Manibus* or *Diis Manibus Sacrum*), followed by particulars with regard to the deceased, his age, name, and office, and the name and relationship of the person who has had the urn made. The letters D. M. frequently occur in Christian epitaphs found in the Catacombs. A not uncommon feature of the Roman inscription is the strong adjuration addressed to the passers-by not to disturb the tomb, and a grievous curse for the man who should violate this injunction. They contain often, also, an admonition to the passer-by to stop and read the record on the tomb. Latin remained till very recent times the usual language for epitaphs in England, at least in the case of famous men and women.

In modern as in ancient times, the epitaph has been made a literary form, as, e.g., by Ben Jonson and Pope. Dr. Samuel Johnson wrote an essay on epitaphs; so, too, did William Wordsworth. For Greek epitaphs, consult: Kaibel's *Epigrammata Græca ex Lapidibus Collecta* (Berlin, 1878); Reinach, *Traité d'épigraphie grecque* (Paris, 1885); Preger, *Inscriptiones Græcæ Metricæ ex Scriptoribus præter Anthologiam Collectæ* (Leipzig, 1891); *Corpus Inscriptionum Atticarum* (Berlin, 1878–82). For Latin epitaphs: *Corpus Inscriptionum Latinarum* (ib., 1863 et seq.); Bücheler and Riese, *Anthologia Latina*, vol. ii (Leipzig, 1869–70), especially the second part, *Carmina Epigraphica Latina* (ib., 1895–97), interestingly reviewed by Abbott, in *American Journal of Philology*, vol. xix (New York, 1898); Tolman, *A Study of the Sepulchral Inscriptions in Bücheler's Carmina Epigraphica Latina* (Chicago, 1910); Clara L. Thompson, *Tædium Vitæ in Roman Sepulchral Inscriptions* (St. Louis, 1911); Armstrong, *Autobiographic Elements in Latin Inscriptions* (New York, 1910); Cholodniak, *Carmina Sepulcralia Latina* (St. Petersburg, 1897). For modern epitaphs, consult: Kippax, *Churchyard Literature: A Choice Collection of American Epitaphs* (Chicago, 1876); Andrews, *Curious Epitaphs* (London, 1883). See EPIGRAM; ANTHOLOGY; SIMONIDES (OF CEOS).

EP'ITHALA'MIUM (Lat., from Gk. *ἐπιθαλάμιος*, *epithalamios*, nuptial, from *ἐπί*, *epi*, upon, at + *θάλαμος*, *thalamos*, bridal chamber: supply *ὕμνος*, *hymnos*, hymn). Among the ancient Greeks and Romans a marriage song sung by a chorus of maidens, or of youths and maidens, before the chamber of a newly married couple. It was sung ordinarily on the evening of the marriage day; but there was also a waking song. Closely connected with the epithalamium is the hymeneal song (*ὑμέναιος*), which was sung either at the wedding banquet or during the marriage procession to the new home. As a general term, the hymeneal includes the epithalamium. Among the Greeks the epithalamia and hymeneals of Sappho were prized above all others: but Alcman, Anacreon, Stesichorus, Pindar, and others also composed such marriage hymns. The eighteenth Idyl of Theocritus is an epithalamium on the marriage of Menelaus and

Helen. At Rome, in the first century B.C., the Alexandrine school of poets practiced epithalamia after Greek models. Three by Catullus are extant (Nos. 61, 62, and 64), in which the Greek form is greatly modified. The epithalamium gradually became a laudatory poem on the occasion of a wedding; in this form it was cultivated in the Imperial period, by Statius, Ausonius, Sidonius Apollinaris, and Claudianus. A collection of Latin epithalamia, with an introductory essay, is to be found in Wernsdorf, *Poetæ Latinæ Minores*, vol. iv (Helmstedt, 1789). In modern times epithalamia have been written in Latin, Italian, and French; in English epithalamia were composed by Spenser, Ben Jonson, Donne, Quarles, and Tennyson (at the close of *In Memoriam*).

EPITHALAMIUM. A poem by Edmund Spenser, written to celebrate his marriage to Elizabeth Boyle (June 11, 1594).

EP'ITHE'LIO'MA (Neo-Lat., from Gk. ἐπί, *epi*, upon + θηλή, *thēlē*, nipple, from θᾶν, *than*, to suckle). A variety of cancer, which attacks surfaces covered with epithelium or epidermis. See TUMOR.

EP'ITHE'LIUM (Neo-Lat., from Gk. ἐπί, *epi*, upon + θηλή, *thēlē*, nipple). A tissue widely distributed in the animal body. Its main function may be said to be that of acting as a covering for various surfaces, both external and internal, and as the active structural elements of those organs of the body which are known as glands. Thus, as the outer layer of the skin, epithelium covers the entire body and forms the hair, nails, sweat glands, etc. It covers all the mucous membranes, thus lining the entire respiratory tract, the genito-urinary tract, and the alimentary canal. It forms the essential elements of the true glands, such as the liver, pancreas, and submaxillary. Epithelium may be classified as follows: 1. Squamous: (*a*) simple, (*b*) stratified. II. Columnar: (*a*) simple, (*b*) stratified. III. Modified: (*a*) ciliated, (*b*) goblet, (*c*) pigmented. IV. Special: (*a*) glandular, (*b*) neuro-epithelium.

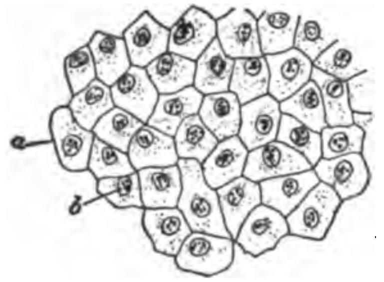


FIG. 1. SQUAMOUS EPITHELIUM OF EPIDERMIS.
Magnified 250 times : *a*, squamous cell; *b*, nucleus.

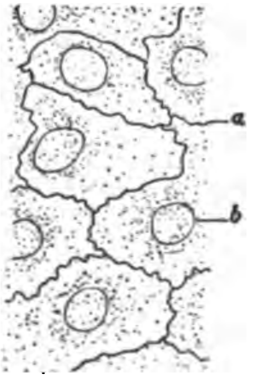


FIG. 2. SQUAMOUS EPITHELIUM OF OMENTUM.
Magnified 250 times: *a*, silvered outlines of cell; *b*, nucleus.

I. **Squamous Epithelium.** (*a*) *Simple Squamous Epithelium.*—This is not abundant in the human body. It lines the air spaces of the lungs, the membranous labyrinth of the ear, and occurs in a few other places. It consists of a single layer of flat cells, presenting the appearance of a mosaic when seen from the flat surface. (*b*) *Stratified Squamous Epithelium.*—Here the cells are laid down in several layers, only the surface cells being flat, the deeper layers irregular or cuboidal in shape, the innermost layer resting on a distinct membrane, the *membrana propria*. Sometimes the cells of the middle layers are united by minute spines and are known as prickle cells. The main locations of this form of epithelium are the skin and all its openings—the œsophagus, larynx, pharynx, ureter, bladder, pelvis of the kidney, the entire female urethra, and the terminal portion of the male urethra.

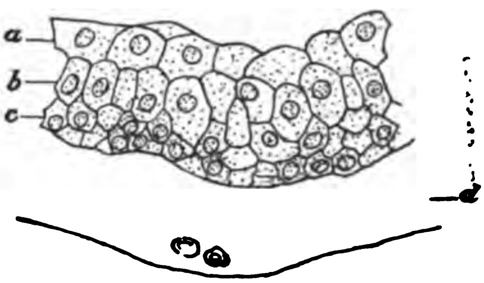


FIG. 3. TRANSITIONAL EPITHELIUM OF BLADDER.
Magnified 300 times: *a*, superficial layer of cells; *b*, intermediate layer of cells; *c*, deep layer of cells; *d*, fibrous tissue.

II. **Columnar Epithelium.** (*a*) *Simple.*—This consists of a single layer of columnar cells placed side by side, their bases resting on a thin membrane, the *membrana propria*, or basement membrane. Epithelium of this type lines the entire alimentary tract, the ducts of glands, and their alveoli, and portions of the male urethra. (*b*) *Stratified Columnar Epithelium.*—Only the surface cells are truly columnar, the deeper layers being made up of cells irregular in shape. It is not widely distributed, examples being found in the *vas deferens* and in the nasal fossæ.

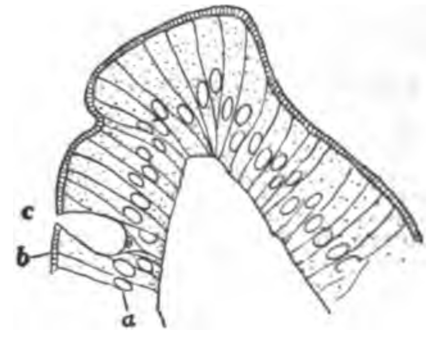


FIG. 4. COLUMNAR EPITHELIUM OF INTESTINE.
Magnified 300 times: *a*, layer of columnar epithelial cells; *b*, striated hem of epithelial cells; *c*, mucous cell.

III. **Modified Epithelium.** (*a*) *Ciliated.*—These cells have minute, hairlike projections from their free surfaces, known as cilia. These cilia possess a vibratory motion, always acting in the same direction and thus determining flow of currents. They occur only on columnar epithelium, either of the simple or stratified type. Ciliated epithelium lines the cavity of the uterus, the oviducts, the lacrymal ducts, the Eustachian tubes, and parts of the tympanic cavity, nasal fossæ, larynx, trachea, bronchi, and *vas deferens*. These minute cilia exert a considerable power. Thus, in the respiratory tract they seem to keep the tubes free from any minute particles of foreign substance which may have entered them. (*b*) *Goblet*.—This is a form of cell occurring in columnar epithelium in which the contents of the cell are transferred into a transparent substance known as mucus, which is finally discharged upon the free surface of the membrane. (*c*) *Pigmented*.—In this form of epithelium the cells contain granules usually of a brown or black color and known as pigment. Such cells are found in the retina and in the skin, especially of the darker races.

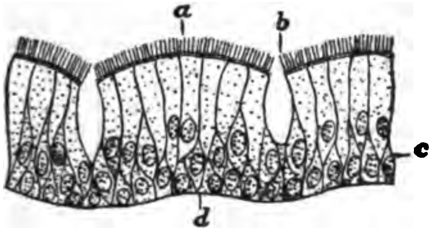


FIG. 5. CILIATED EPITHELIUM OF TRACHEA.

Magnified 300 times: *a*, ciliated cells; *b*, goblet or mucin cells; *c*, germinal cells; *d*, basement membrane.

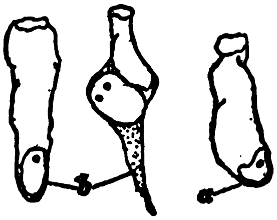


FIG. 6. DISSOCIATED GOBLET EPITHELIUM FROM INTESTINE.

Magnified 450 times: *a*, nucleus; *b*, remains of protoplasm of cell.

IV. **Specialized Epithelium.** (*a*) *Glandular Epithelium*.—This name is applied to those forms of epithelium which make up the various glands of the body. Such epithelium presents wide ranges of variations for different glands. (*b*) *Neuro-Epithelium*.—This is a specialization of epithelium for the purpose of forming terminations for nerve fibres. Many of these terminations in certain organs are extremely complex—e.g., the rods and cones of the retina, the hair cells of Corti's organ, and the taste buds. Consult Bailey and Miller, *Textbook of Histology* (New York, 1913), and Sturling, *Principles of Human Physiology* (London, 1912).

EP'ITHEM (Gk. *ἐπίθημα, epithēma*, cover, from *ἐπί*, epi, upon + *θῆμα, thēma*, box, from *τιθέναι, tithenai*, to place). In plants, the internal tissue of a hydathode; a gland that excretes water. See HYDATHODE.

EPITOME, ė-pĭt'ō-mē (Lat., from Gk. *ἐπιτομή*, from *ἐπί, epi*, upon + *τομή, tomē*, a cutting, from *τέμνειν, temnein*, to cut). A condensation of the work of an author or of an encyclopædia or the like. Condensations were frequently made by mediæval scholars, and the practice is not rare in later times; witness the condensed version of Richardson's interminable novel *Clarissa Harlowe*, that of the French encyclopædia *Larousse*, and the *Epitome* (1906) in one volume of the monumental *Dictionary of National Biography*.

EP'IZO'A. See ENTOZOA.

EPIZOÖTIC, ĕp'ĭ-zō-ŏt'ĭk (Gk. *ἐπί, epi*, upon + *ζῷον, zōon*, animal). A disease which is carried from one place to another by means of infection, and which occurs as a more or less serious outbreak of limited duration. Epizoötic in veterinary medicine corresponds to the term "epidemic" in human medicine. See INFLUENZA IN ANIMALS.

E PLU'RIBUS U'NUM (Lat., one out of many). The national motto of the United States, proposed by Franklin, Adams, and Jefferson, the committee appointed by Congress on July 4, 1776, to prepare designs for a seal.

EP'OCH, ĕp'ŏk *or* ē'pŏk (ML. *epocha*, Gk. *ἐποχή, epochē*, epoch, pause). In astronomy, one of the elements (q.v.) of a planet's orbit. It is necessary that these elements should include a statement of the date when the planet passed through perihelion, or its point of nearest approach to the sun. That date, with the hour and exact fraction of an hour, is called the epoch. It may also be an arbitrary fixed date—generally the beginning of a century or half century—to which all the elements are referred. The heliocentric (q.v.) longitude is then given for this instant, and this is frequently referred to as the epoch; more properly, it is the longitude of the epoch. See also CHRONOLOGY.

EPOCH, IN GEOLOGY. See GEOLOGY.

EP'ODE (Lat. *epodus*, from Gk. *ἐπῳδός, epōdos*, epode, from *ἐπί, epi*, upon, in addition to + *ᾠδή, ōdē*, song, from *ἀείδειν, aeidein*, to sing). A name given by grammarians to any poem in which the metrical unit is a distich, consisting of a long verse and a shorter verse, especially when an iambic trimeter is followed by an iambic dimeter, as in Horace's *Epodes* 1–10. Epodes of this sort had been written by Archilochus (q.v.) and Stesichorus (q.v.). In the distich here used the second verse of such couplet is a sort of metrical refrain. Horace called these poems *Iambi*, partly by reason of their metre, partly because in them he reproduced the censorious spirit of the poems of Archilochus, themselves largely in iambic verse. Consult Sellar, *Horace and the Elegiac Poets*, 118–131 (Oxford, 1912). In Greek choral poetry the term is also applied to an ode which follows a strophe and an antistrophe, or a series of strophes and antistrophes, and so forms the third or after part, so to say, in the series.

EPOMEO, ā'pō-mā'ō (Lat. *Epomeus*, *Epopeus*). A volcanic mountain, rising to 2588 feet, 16 miles southwest of Naples, on the island of Ischia (Map: Italy, B 11). It is also called Mount San Nicola, from the hermitage of San Nicola, hewn in the rock just below the summit, which commands on the west a panoramic view of the sea; on the north, of the distant snow-capped peaks of the Abruzzi, of the Bay of Gaeta, and of the coast from Mount Circeo to Cape Miseno; on the east, of Vesuvius and of the Bay of Naples and its beautiful shore from the island of Procida to the island of Capri. On account of the eruptions of the volcano the island was deserted by most of the inhabitants in 474 B.C. The last of numerous recorded eruptions occurred in 1302; it left a stream of lava that is still plainly noticeable where it is crossed by the road near the town of Ischia. A large mass from Mount Epomeo was displaced by the earthquake of July 28, 1883. Mythology pictured the giant Typhœus (Vergil, *Æneid*, ix, 716), after being transfixed by the thunderbolt of Jupiter, as buried beneath Mount Epomeo and by his struggles causing its eruptions.

EPOMEUS, EPOPEUS. See EPOMEO.

EPONA, ĕp′ō-nȧ (Lat. *Epona*). A goddess of stables and of horses, asses, and mules, worshiped first in ancient Gaul, and later, by the first century A.D., in Rome (Juvenal, viii, 157). She was believed to secure for the animals named above their food, and to protect them, not only against accidents, but against the malign beings that, it was thought, cast spells over stables by night. Inscriptions in her honor have been found in Gaul, Germany, the Danube country, and in Rome (in the latter city chiefly on the site of the barracks occupied by recruits from the Batavi). Consult Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

EPON′YMUS (ἐπώνυμος, *epōnymos*, an adjective of various meanings, but for the purposes of this article definable as "giving one's name to something or someone," from ἐπί, upon, and ὄνομα, name). A term applied to the archon (q.v.) or to the ephor (see EPHORI) who gave his name to the year. The Greek tribes and cities commonly traced their origin to some eponymous hero; so the 10 tribes established at Athens by Clisthenes were each named after some national hero.

EP′ORE′DIA. See IVREA.

EPOS. See EPIC POETRY.

EP′PING. A town of Essex Co., England, at the north end of Epping Forest, 17 miles north-northeast of London (Map: England, G 5). It is noted for its cream, butter, sausages, and pork, large quantities of which are sent to London. Pop., 1901, 3800; 1911, 4253. Epping Forest is a part of Waltham Forest, which covered all Essex and extended almost to London. It is now limited to a comparatively small area in the southwest part of the county. Here for many centuries a fair was held under the enormous Fairlop oak, no longer existent, and a stag was yearly turned out in the forest on Easter Monday to be hunted by the general public. In 1882, 5600 acres of Epping Forest were bought by the Corporation of London and declared free to the public in perpetuity.

EPPING FOREST. See EPPING.

EP′SOM. A market town on the margin of the Banstead Downs in Surrey, England, 14 miles south-southwest of London (Map: England, F 5). The famed sulphate of magnesia springs of Epsom gave their name to the Epsom salts formerly manufactured from them. The Royal Medical College erected on the Downs provides education for about 170 boys, the sons of medical men, and affords a home to indigent members of the profession and their widows. The electric-light and water supply are owned by the corporation. Pop., 1901, 10,900; 1911, 19,156. On the Downs, 1½ miles south of the town, the famous Epsom horse races are held yearly. They are said to have been held here in the reign of James I. See HORSE RACING.

EP′SOMITE. A natural hydrous magnesium sulphate corresponding in composition to Epsom salt (q.v.). It is usually found in white botryoidal masses and delicately fibrous crusts and is characterized by its bitter saline taste.

EPSOM SALT. A hydrous magnesium sulphate found native as the mineral kieserite and as epsomite, also in mineral waters. The kieserite is found in the Stassfurt salt beds, and the epsomite occurs in the gypsum quarries of Montmartre, France, in Spain, in Chile, and in the limestone caves of Indiana, Kentucky, and Tennessee, and especially in the Mammoth Cave, Kentucky. It was originally obtained from the waters of the mineral spring in Epsom, England, and subsequently was made by decomposing dolomite with sulphuric acid; but the principal source of the commercial salt is now the Stassfurt salt mines in Saxony, where the crude mineral is separated from the accompanying magnesium and sodium chlorides by dissolving out these two salts with water, which leaves the magnesium sulphate as a fine powder that may be purified by crystallization from water. Epsom salt is used in medicine as a cathartic; it is also employed for agricultural purposes, in the process of warp-sizing cotton, and for dyeing with aniline colors.

EPSTEIN, JACOB (1880–). An English sculptor. He was born in New York, of Russian-Polish parentage, studied under Rodin in Paris, and later took up his residence in London. His first important work was 18 symbolical nude figures for the façade of the new building of the British Medical Association on the Strand (1907–08), placed 50 feet above the ground and representing "Hygeia," "Chemical Research," "Maternity," "Youth," etc. By reason of their excessive realism they excited the animosity of the press and various religious bodies, but they found able defenders in Herbert Gladstone and Sir Martin Conway. Epstein's tomb of Oscar Wilde in Père Lachaise Cemetery, Paris, was erected in 1909. Later he executed the decoration of Church Square, facing the government buildings, at Pretoria, Transvaal. His art is exceedingly modern and represents a revolt against mere prettiness in imitation of the Greek.

EP′WORTH LEAGUE. An organization of the young people of the Methodist Episcopal church, formed in 1889 at Cleveland, Ohio, by the combination of five young people's organizations at that time existing. The purpose of the league is the promotion of intelligent and vital piety among the young people of the church. It conducts classes in Bible study, missions, social service, and personal evangelism. Institutes are held annually, in which trained specialists give instruction in the different forms of Christian work. The league also supplements the work of the denomination in its various mission fields. The league exists in both the Northern and Southern branches of the Methodist Episcopal denomination and also in the Methodist church of Canada. In the latter it was organized in 1890. The Junior Epworth League is an organization of the baptized children over the age of 10 years. The admission of children not baptized is also permitted. Plans for the Junior League include a graded outline for the social life and activities coördinating the work of the boys' and girls' clubs, and a graded course of study covering a practical method of bringing the Bible in touch with the everyday life of children. Courses in Church history, government, doctrines, and benevolences are also included. The membership of the senior branch in the Methodist Episcopal church North in 1913 was 593,465, and of the junior branch 218,509. In the Methodist Episcopal church South there were, in 1913, 3846 chapters of the league, with 133,797 members. The headquarters of the Northern League are in Chicago, and its organ is the *Epworth Herald*. The organ of the Southern branch is the *Epworth Era*, published monthly at Nashville, Tenn. Consult: Bacon and Northrop, *Young People's Societies* (New York, 1900); *The Methodist Year Book;* Dan B. Brummett, *Epworth League Methods* (ib., 1906).

EQUAL'ITY. A vague term of varying signification in the recent history of social and political speculation. In its primary sense it denotes the equal worthiness of all human beings, and calls for such an arrangement of the structure of society as to insure to all an equal degree of the essential advantages of life. It is in this sense that it was employed by Rousseau in his famous declaration that it was the function of the state to maintain liberty and equality among its subjects (*Contrat Social*, ii, 11), and in the assertion of the American Declaration of Independence of the "self-evident" truth that all men are created equal. It was this kind of equality that, under the influence of Rousseau, the French Revolution aimed to realize, and the ideal to which it points has been the inspiration of more than one movement for the emancipation of humanity. How much the steady march of the democratic movement of the last century and the spread of popular government owe to this humanitarian sentiment for equality can only be imagined. It is in this extreme and sentimental form, also, that the doctrine has incurred the hostile criticism of hard-headed and unsympathetic writers such as Mr. Justice Stephen (*Liberty, Equality, and Fraternity*) and Sir Henry Maine (*Popular Government*). The influence of the doctrine in the communistic and socialistic movements of the day will be described in connection with those topics.

The term "equality" is somewhat more definitely employed in a secondary sense to denote one of the two great aims of the modern democratic movement in society and politics. One of these aims is individual liberty, and the other is such a measure of equality as is compatible with a rational liberty. The reconciliation of these two conflicting aims is the great task of government, and it is through this process of reconciliation that the conception of equality has been brought within the sphere of practical discussion. As a political programme, then, it includes the following definite aims: first, equality of political status; second, equality of civil rights; and third, equality of opportunity. The first of these is secured by the widest possible extension of the principle of popular government; the second by the abolition of privilege, whether based on wealth, on birth, or on public service; the third by breaking down the artificial barriers of caste, affording to all an equal enjoyment of public utilities and the advantages of a common education. Equality of political rights and equality before the law have been measurably attained in some favored lands, but industrial equality is still far to seek.

This principle of human equality is a purely modern conception and had its origin in the Christian conception of the equality of all men before God. It derived its impulse, as a social and political principle, mainly from the passionate writings of Jean Jacques Rousseau. See DEMOCRACY; LIBERTY OF THE INDIVIDUAL. Consult the authorities referred to under such titles as DEMOCRACY; POLITICAL SCIENCE, ETC.

EQUAL RIGHTS PARTY, THE. See LOCOFOCO.

EQUA'TION (Lat. *æquatio*, from *æquare*, to equalize, from *æquus*, equal). In algebra, an equality which exists only for particular values of certain letters representing the *unknown quantities* is called an *equation*. These particular values are called the *roots* of the equation, and the determination of these roots is called the *solution* of the equation. Thus, $2x + 3 = 9$ is an equation, because the equality is true only for a particular value of the unknown quantity x, viz., for $x = 3$. The expression $2 + 5 = 7$ expresses an equality, but it is not an equation as the word is technically used in mathematics. Expressions like $(a + x)^2 = a^2 + 2ax + x^2$ are true for all values of the letters and are called *identities* to distinguish them from those equalities which are, in the stricter use of the term, known as equations. If an algebraic function $f(x)$ equals zero, and is arranged according to the descending, integral, positive powers of x, it has the form $f(x) = a_0x_n + a_1x^{n-1} + \dots\dots + a^n{}_{-1}\, x + a_n = 0$. Such an equation is called a complete equation of the nth degree with one unknown quantity; e.g., $a_0x^2 + a_1x + a_2 = 0$ is a complete equation of the second degree, while $a_0x^2 + a_2 = 0$ is an incomplete equation of the second degree. The letters $a_0, a_1, \dots\, a_{n-1}, a_n$ stand for known quantities, and in the theory of equations, so called, they stand for *real* quantities. They are all coefficients of powers of x, except the *absolute term*, a^n, which may be considered the coefficient of x^0. In case $a_0, a_1, \dots a$ are all expressed as numbers, the equation is said to be *numerical;* otherwise it is known as *literal*.

Equations may be classified as to the number of their unknown quantities. Those already mentioned involve a single unknown, but $x^2 + xy + y^2 = 0$ and $xy = 1$ involve two unknowns. There is no theoretical limit to the number of unknown quantities. Equations may also be classified as to degree, this being determined by the value of n in the complete equation already given. Thus,

$$\begin{aligned} a_0 x + a_1 &= 0 \\ a_0 x^2 + a_1 x + a_2 &= 0 \\ a_0 x^3 + a_1 x^2 + a_2 x + a_3 &= 0 \\ a_0 x^4 + a_1 x^3 + a_2 x^2 + a_3 x + a_4 &= 0 \end{aligned}$$

are equations respectively of the first degree (simple or linear equation), of the second degree (quadratic equation), of the third degree (cubic equation), and of the fourth degree (quartic or biquadratic equation).

If two or more equations are satisfied by the same value of the unknown quantities, they are said to be *simultaneous*, as in the case of $x^2 + y = 7$, $x + y^2 = 11$, where $x = 2$, $y = 3$; but $x^2 + y = 7$ and $3x^2 + 3y = 9$ are not simultaneous; they are *inconsistent*, there being no values of x and y that will satisfy both; and $x^2 + y = 7$ and $3x^2 + 3y = 21$ are said to be *identical*, each being derivable from the other. In case there is not a sufficient number of relations given to enable the roots of an equation to be determined, exactly or approximately, the equation is said to be *indeterminate;* e.g., in the equation $x + 2y = 10$, any of the following pairs of values satisfies the equation: (0, 5), (1, 4.5), (2, 4), (3, 3.5), ... (10, 0), (11, −0.5), ... In general, n linear equations, each containing $n + 1$ or more unknown quantities, are indeterminate. Thus, $2x + 3y + z = 10$, $3x + 2y + z = 8$, give rise to the simple equation $-x + y = 2$, which is indeterminate. Equations may also be classified as *rational*, *irrational*, *integral*, or *fractional*, according as the two members, when like terms are united, are composed of expressions which are rational, irrational (or partly so), integral, or fractional (or partly so), respectively, *with respect to the unknown quantities;* e.g.:

$3x+\sqrt{5}=0$ is a rational integral equation,

$6+\frac{3}{4}\sqrt{x}=0$ is an irrational integral equation,

$\frac{2}{x}+\sqrt{14}=0$ is a rational fractional equation,

$(x+3)^{-\frac{1}{2}}=5$ is an irrational fractional equation.

Algebra is chiefly concerned with the solution of equations, and definite methods have been devised for determining the roots of algebraic equations of the first, second, third, and fourth degrees. Equations of the first degree are solved by applying the common axioms: if equals are added to equals, the results are equal; if equals are subtracted from equals, the results are equal; and the corresponding axioms of multiplication and division. Equations of the second degree may be solved by reducing the quadratic function to the product of two linear factors, thus making the solution of the quadratic equation depend upon that of two linear equations.
Thus, $x^2+px+q=0$ reduces to

$$\left(x+\frac{p}{2}+\frac{1}{2}\sqrt{p^2-4q}\right)\left(x+\frac{p}{2}-\frac{1}{2}\sqrt{p^2-4p}\right)=0,$$

whence

$$x+\frac{p}{2}\pm\frac{1}{2}\sqrt{p^2-4q}=0,\text{ and }x=-\frac{p}{2}\pm\frac{1}{2}\sqrt{p^2-4q}.$$

Similarly the solution of the cubic equation is made to depend upon that of the quadratic equation, and that of the biquadratic equation upon that of the cubic equation. These formulas, however, when applied to numerical equations, often involve operations upon complex numbers not readily performed and hence are of little value in such cases; e.g., in applying the general formula for the roots of the cubic equation, the cube root of a complex number is often required, in which case the methods of trigonometry are employed. The real roots of numerical equations of any degree may be calculated approximately by the methods of Newton, Lagrange, and Horner, the last being a rediscovery of an old Chinese method and being the one generally preferred.

Equations of the first degree were familiar to the Egyptians in the time of Ahmes (q.v.), since a papyrus transcribed by him contains an equation in the following form: Mass (*hau*), its ⅔, its ½, its 1/7, its whole, gives 37; i.e.,

$$\frac{2}{3}x+\frac{1}{2}x+\frac{1}{7}x+x=37.$$

The ancient Greeks knew little of linear equations except through proportion, but they treated in geometric form many quadratic and cubic equations. (See CUBE.) Diophantus (c.275 A.D.), however, distinguished the coefficients (πλῆθος) of the unknown quantity, gave the equation a symbolic form, classified equations, and gave definite rules for reducing them to their simplest forms. His work was chiefly concerned with indeterminate systems of equations, and his method of treatment is known as Diophantine analysis (q.v.).

The Egyptian mathematicians were acquainted with problems which we would solve by quadratics. The Petrie papyrus (published in 1897) and the Berlin papyrus (No. 6619) both contain such problems. One pair of equations, expressed in modern form, is as follows:

$$x^2+y^2=100$$
$$x:y=1:\tfrac{3}{4}.$$

The Greeks of the time of Euclid could solve a quadratic equation geometrically, and Diophantus could do so with some approach to the symbolic methods.

The Chinese likewise solved quadratic equations geometrically, and Sun Tsc (third century), like Diophantus, developed a method of solving linear indeterminate equations. The Hindus advanced the knowledge of the Greeks. Bhaskara (twelfth century) used only one type of quadratic equation, $ax^2+bx+c=0$, considered both signs of the square root, and distinguished the surd values, while the Greeks accepted only positive integers. The Arabs improved the methods of their predecessors. They developed quite an elaborate system of symbolism. The equations of Al Kalsadi (fifteenth century) are models of brevity, and this plan for solving linear equations, a modified Hindu method, was what was later known as the *regula falsi*. See FALSE POSITION.

The Europeans of the Middle Ages made little advance in the solving of equations until the discovery by Ferro, Tartaglia, and Cardan (sixteenth century) of the general solution of the cubic equation. The solution of the biquadratic equation soon followed, and the general quintic was attacked. But, although much was done to advance the general theory of the equation by Vandermonde, Euler, Lagrange, Bézout, Waring, Malfatti, and others, it was not until the beginning of the nineteenth century that equations of a degree higher than the fourth received satisfactory treatment. Ruffini and Abel were the first to demonstrate that the solution, by algebraic methods, of a general equation of a degree higher than the fourth is impossible, and to direct investigation into new channels. Mathematicians now sought to classify equations which could be solved algebraically and to discover higher methods for those which could not. Gauss solved the cyclotomic group, Abel the group known as the Abelian equations, and Galois stated the necessary and sufficient condition for the algebraic solubility of any equation as follows: If the degree of an irreducible equation is a prime number, the equation is soluble by radicals alone, provided the roots of this equation can be expressed rationally in terms of any two of them. As to higher methods, Tschirnhausen, Bring, and Hermite have shown that the general equation of the fifth degree can be put in the form $t^5-t-A=0$; Hermite and Kronecker solved the equation of the fifth degree by elliptic functions and Klein has given the simplest solution by transcendental functions.

A few of the more important properties of equations are: 1. If r is a root of the equation $f(x)=0$, then $x-r$ is a factor of $f(x)$; e.g., 2 being a root of $x^2+2x-8=0$, then $x-2$ is a factor of x^2+2x-8.

2. If $f(x)$ is divisible by $x-r$, r is a root of $f(x)=0$; e.g., in $(x-2)(x^2+x+1)=0$, $x-2$ is a factor, hence $x-2=0$ satisfies the equation, and $x=2$.

3. Every equation of the nth degree has n roots and no more (the fundamental theorem of

equations due to Harriot, or, in its complete form, to D'Alembert): e.g., $x^4 - 1 = 0$ has four roots, $x = 1, -1, i, -i$, and no more.

4. The coefficients of an equation are functions of its roots. Thus, in

$$x^n + a_1 x^{n-1} + a_2 x^{n-2} + \dots\dots a_n = 0,$$

if $r_1, r_2, \dots\dots r_n$ are the roots, then $a_1 = -(r_1 + r_2 + \dots\dots + r_n)$, $a_2 = r_1 r_2 + r_1 r_3 + \dots\dots + r_{n-1} r_n$, $a_3 = -(r_1 r_2 r_3 + r_1 r_2 r_4 + \dots\dots + r_{n-2} r_{n-1} r_n) \dots\dots a_n = \pm r_1 r_2 \dots\dots r_n$.

5. The number of positive roots of $f(x) = 0$ does not exceed the number of changes of signs in $f(x)$. (Descartes's rule of signs.) For instance, in $x^4 - 3x^3 - 2x^2 + x - 1 = 0$ there are 3 changes of signs, hence there can be no more than 3 positive roots.

6. The special functions associated with the roots of an equation which serve to distinguish the nature of these roots are called *discriminants*; e.g., the general form of the roots of the quadratic equation, $x^2 + px + q = 0$, may be taken as

$$x = -\frac{p}{2} \pm \tfrac{1}{2} \sqrt{p^2 - 4q}.$$

The expression

$$p^2 - 4q$$

is the discriminant, for, if $4q > p^2$, the roots are complex; if $4q = p^2$, the roots are real and equal; if $4q < p^2$, the roots are real and unequal; and if $p^2 - 4q$ is a perfect square, the roots are rational. Similarly the discriminant of the cubic $x^3 + 3hx + g = 0$ is

$$g^2 + 4h^3.$$

The discriminants of equations of higher degree are fully explained in works on the theory of equations.

A *differential equation* is an equation involving differential coefficients (see CALCULUS); e.g.,

$$\frac{d^2y}{dx^2} + a\frac{dy}{dx} = x,$$

from which it is required to find the relation between y and x. The theory of the solution of such equations is an extension of the integral calculus and is a branch of study of the highest importance.

For the general theory of equations, consult: Dickson, *Introduction to the Theory of Algebraic Equations* (New York, 1903); Burnside and Panton, *Theory of Equations* (4th ed., London, 1899–1901), the appendix to which contains valuable historical material; Petersen, *Théorie des équations algébriques* (trans. by Laurent, Paris, 1897); Salmon, *Lessons Introductory to Modern Higher Algebra* (Dublin, 1859, and subsequent eds.); Serret, *Cours d'algèbre supérieure* (3d ed., Paris, 1866); Jordan, *Traité des substitutions et des équations algébriques* (ib., 1870). An extensive work, covering both history and method, is Matthiessen, *Grundzüge der antiken und modernen Algebra der litteralen Gleichungen* (Leipzig, 1896).

EQUATION, ANNUAL. One of the most conspicuous of the subordinate fluctuations in the moon's motion, due to the action of the sun. It consists in an alternate increase and decrease in the moon's longitude, corresponding with the earth's situation in its annual orbit, i.e., to its angular distance from perihelion, and therefore it has a year instead of a month, or aliquot part of a month, for its period. See LUNAR THEORY.

EQUATION, CHEMICAL. See CHEMISTRY.

EQUATION, PERSONAL. A very important factor in astronomical or other scientific observations. Two observers, each of admitted skill, often differ in their record of the same event—as the passage of a star before the wires of a transit instrument—by a quantity nearly the same for all observations by those persons. This quantity is their relative personal equation. Each observer habitually notes the time too early or too late, by a small and nearly uniform portion of a second. This quantity is his absolute personal equation. Machines have been invented for determining the amount of personal equation by reproducing artificially the kind of observation usually affected with this form of error in actual work on the sky. The so-called Repsold apparatus is a mechanical device which so changes the condition of observation with a transit instrument or meridian circle that the personal equation is removed altogether, and its quantitative evaluation is rendered unnecessary.

EQUATION OF LIGHT. In astronomical observations, the ray of light by which we see any celestial body is not that which it emits at the moment we look at it, but which it did emit some time before, viz., the time occupied by light in traversing the space which separates us from the celestial body. The quantity of time so required for the passage of light from the sun to the earth is the so-called light equation. It amounts to about 8 minutes, 20 seconds.

EQUATION OF PAYMENTS. A method of finding the time when, if a sum of money is paid all at once by a debtor, instead of several debts payable by him at different times, no loss will be sustained by either the debtor or creditor. The common rule is: Multiply each debt by its term of credit, and divide the sum of the products by the sum of the debts. The quotient will be the average term of credit. This added to the date from which the credits were reckoned will give the average time of payments; e.g., to find the average time of paying \$200 due April 1, \$200 due May 11, and \$400 due June 30: \$200 + 40 × \$200 + 90 × \$400 = \$44,200; \$44,200 ÷ \$800 = 55. April 1 + 55 days = May 26, the equated time. This method is incorrect, except for equal debts, because it takes no account of the balance of interest and discount. It is, however, sufficiently accurate for ordinary use.

EQUATION OF THE CENTRE. A term used by astronomers in connection with the planets' orbital motions. The anomaly (q.v.) of a planet does not increase uniformly after perihelion passage, because, according to Kepler's law, a line joining the planet with the sun sweeps over equal areas (*not* equal angles) in equal times. The angle by which the true anomaly exceeds the mean anomaly is called the equation of the centre.

EQUATION OF THE EQUINOXES. The difference between the actual position of the equinoxes (q.v.) and the position calculated on the assumption that their motion is uniform. See PRECESSION.

EQUATION OF TIME. The amount which must be added to the apparent time to obtain the mean time; in other words, the mean time of apparent or true noon. The sun's motion in the ecliptic is not uniform. This want of uniformity would of itself be sufficient to cause an irregularity in the intervals of time between successive returns of the sun to the meridian, day after day; but besides this want of uniformity in the sun's apparent motion in the ecliptic, there is another cause of inequality in the time of his coming to the meridian, the obliquity of the ecliptic to the equinoctial. These two independent causes conjointly produce the inequality in the time of his appearance on the meridian, the correction for which is the equation of time. The equation of time varies from day to day and is to be found tabulated in astronomical almanacs, such as the *Nautical Almanac*, under the heading "Sun before clock" or "Sun after clock." It is zero at four different times in the year, when the mean and unequal motions exactly agree—viz., about April 15, June 15, August 31, and December 24; on account of leap year, these dates may vary by a day. From December 24 to April 15 and from June 15 to August 31, the equation of time is positive, i.e., the sun is slow or "after the clock," the maximum amounts being 14 minutes, 28 seconds on February 11, and 6 minutes, 17 seconds on July 26; during the remaining portions of the year the equation of time is negative, and the sun is fast, or "before the clock," the maximum amounts being 3 minutes, 49 seconds on May 14, and 16 minutes, 21 seconds on November 3.

EQUA'TOR, Celestial (ML. *æquator*, equalizer, from Lat. *æquare*, to equalize). The great circle which would be cut out on the sky by extending the plane of the earth's equator.

EQUATOR, Terrestrial. The great circle on the earth's surface, halfway between the poles, which divides the earth into the Northern and Southern hemispheres.

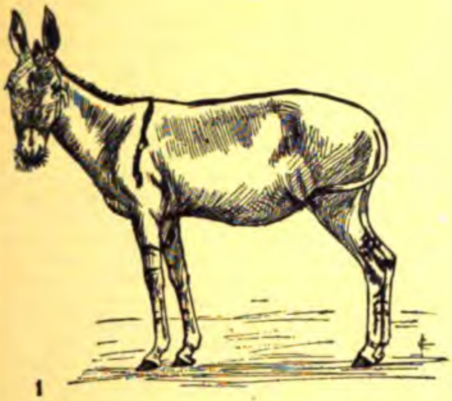
E'QUATO'RIAL (from ML. *æquator*, equalizer). A term applied in astronomy to a method of mounting astronomical telescopes, by which a celestial body may be observed at any point of its diurnal course. It consists of a telescope fastened to a graduated circle, called the declination circle, whose axis is attached at right angles to that of another graduated circle called the hour circle and is wholly supported by it. The hour-circle axis, which is called the principal axis of the instrument, turns on fixed supports; it is pointed to the pole of the heavens, and the hour circle is of course parallel to the equinoctial. This combination of axes gives us a universal joint, thus enabling us to point the tube at any star in the sky; and with the pair of circles we can measure and record the exact position in the sky of the star under observation. On account of one axis being pointed at the pole, about which all the stars revolve in their diurnal course, it becomes possible to follow their motions by rotating the telescope about this one axis only, and this rotation can be effected easily and conveniently with clockwork. See Telescope.

E'QUES'TRIAN ORDER (Lat. *ordo equester*), or **EQ'UITES** (Lat., horsemen, knights, from *equus*, horse). Originally the cavalry of the Roman army. Romulus, it is said, selected from the three principal Roman tribes a cavalry bodyguard of 300, called *celeres*. By the constitution of Servius Tullius 18 centuries (see Comitia) of equites were created. (See Rome, *History of Rome during the Earliest or Regal Period.*) The number was afterward gradually increased to 1800, who were partly of patrician and partly of plebeian rank and were required to possess a certain amount of property (400,000 sestertii, about $17,000). Each of these equites received a horse from the state and another for his groom, together with an allotment for the keep of the horses; such horsemen were known as *equites equo publico*, horsemen or knights with a state horse; but about 403 B.C. a new body of equites began to make their appearance, composed of wealthy citizens who furnished a horse at their own expense (*equites equo privato*). The equites were reviewed by the *censors* (see Censor); equites who failed to meet the tests of physique and character were dropped from the rolls. Until 123 B.C., the equites were exclusively a military body; but in that year Caius Gracchus carried a measure by which all the *judices* (jurors) had to be selected from them. Now, for the first time, they became a distinct order or class in the state, nonmilitary in character, and were called *ordo equester*. Sulla deprived them of this privilege; but their power did not then decrease, as the farming of the public revenues appears to have fallen into their hands. (See Publicani.) They became the money aristocracy of Rome. To the title of *Senatus populusque Romanus* was added *et ordo equester*. As their insignia, the equites wore a gold ring and the *angusticlavus* (the tunic with two narrow crimson stripes down the front). From the time of Augustus the *ordo equester* became again military in character.

From these equites the higher officers of the army were chosen. To fit him for high command, each eques was required to pass through a definite sequence of offices, known as the *equestris cursus honorum*. From the equites, too, certain magistrates were chosen. Hence admission to the equites constituted, in effect, an introduction to public life. Consult Egbert, *Introduction to the Study of Latin Inscriptions* (New York, 1896). On the equites in general, consult article "Equites" in Smith, *A Dictionary of Greek and Roman Antiquities* (3d ed., London, 1890); Greenidge, *A History of Rome*, vol. i (ib., 1905); the article "Equites Romani," in Pauly-Wissowa, *Real-Encyclopädie der classischen Altertumswissenschaft*, vol. vi (Stuttgart, 1909).

EQUESTRIAN STATUE. The representation in sculpture of a person on horseback. Equestrian statues were not commonly erected in Greece, but in Rome they were often awarded as a high honor to military commanders and persons of distinction, and latterly were, for the most part, restricted to the emperors, the most famous in existence being that of the Emperor Marcus Aurelius, which now stands in the piazza of the Capitol at Rome. It is the only ancient equestrian statue in bronze that has been preserved. They were not erected during the Middle Ages, except at the close of the epoch when stone equestrian statues of St. George and St. Martin were carved, especially in France. From the same period are the three remarkable Della Scala monuments at Verona. The first bronze equestrian statue of the Renaissance, and therefore of modern art, was that of Gattemelata by Donatello at Padua, and the finest that of Bartolommeo Colleoni by Verrocchio in Venice—probably the grandest equestrian statue in existence. Characteristic examples of equestrian statues during the baroque period are: "The Great Elector" by Andreas Schlüter in Berlin, Louis XI by Petitot in

EQUIDÆ



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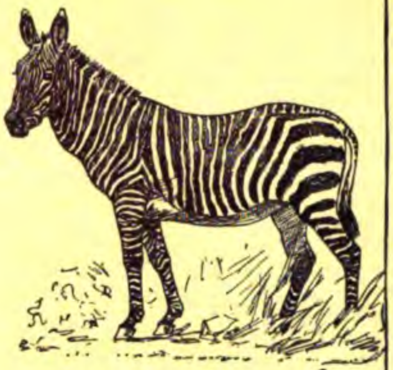

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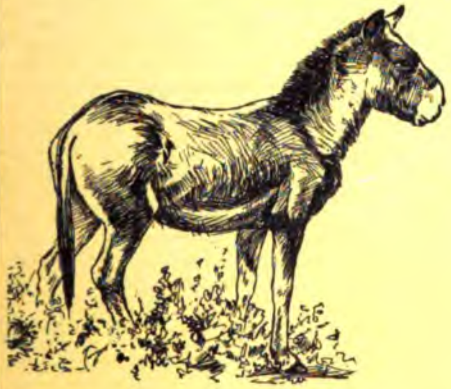

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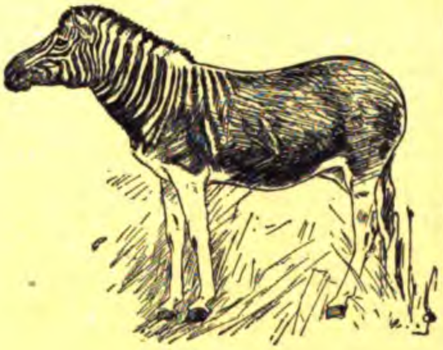

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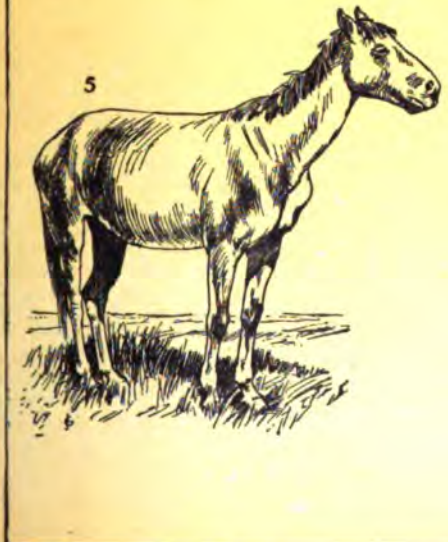

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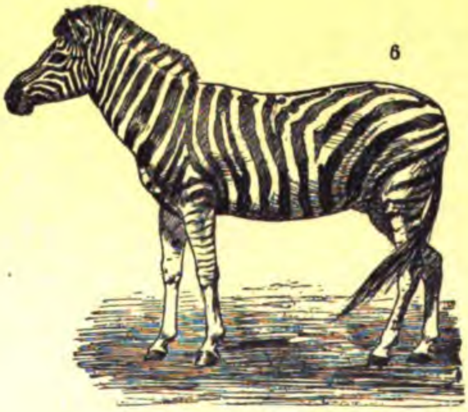

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1. AFRICAN WILD-ASS (Equus asinus).
2. TRUE, OR MOUNTAIN ZEBRA (Equus zebra).
3. KIANG, OR ASIATIC WILD-ASS (Equus hemionus).
4. QUAGGA (Equus quagga); extinct.
5. MUSTANG OF SOUTHWESTERN UNITED STATES.
6. BURCHELL'S ZEBRA (Equus Burchellii).

Versailles, Peter the Great by Falconet in St. Petersburg. During the nineteenth century bronze equestrian statues were indefinitely multiplied to such an extent that few important cities in Europe or America are without one or more examples. According to statistics gathered in 1913 there are about 630 in the world, 89 of which are in the United States. Paris leads with 25, including the statue of Joan of Arc by Fremiet, Lafayette by Paul Bartlett, and Washington by Daniel Chester French and Potter. Berlin has 14, including Frederick the Great (for illustration see the Plate with article RAUCH) by Christian Rauch—one of the very finest of modern times—and William I by Reinhold Begas. Other prominent European examples are: Maximilian I by Thorvaldsen at Munich; the four equestrian statues of the Maria Theresa monument by Zumbusch; and Alexander III by Troubetskoy at St. Petersburg. Among the finest recent examples in England are Hugh Lupus by G. F. Watts (Chester) and the Duke of Wellington (in St. Paul's Cathedral) by Alfred Stevens.

The first equestrian statue in the United States was that of General Jackson in Washington, designed and cast by Clarke Mills in 1853 (replicas in Nashville and New Orleans); the second was the well-known "Washington" by H. K. Brown in New York—still one of the most notable in the country. There is an especially large number at Washington (12 in 1913), including General Thomas by J. Q. A. Ward, General McClellan by MacMonnies, and General Sheridan by Gutzon Borglum; an equal number in Philadelphia, particularly in connection with the Richard Smith Memorial, Fairmount Park. Boston also possesses several good examples, including those of Washington by Thomas Ball, Colonel Shaw by Saint-Gaudens, and General Hooker by D. C. French and E. C. Potter; Chicago also has good examples. Among other notable equestrian statues in the United States are those of General Sherman by Saint-Gaudens in New York, General Slocum by MacMonnies in Brooklyn, N. Y., Robert E. Lee by Mercier in Richmond, Va., and the Volunteer Monument by Douglas Tilden in San Francisco. Some of the battlefields of the Civil War, particularly Gettysburg, have been transformed into parks and contain a number of equestrian statues. Consult Quimby, *The Equestrian Monuments of the World* (New York, 1903).

E'QUIAN'GULAR (from Lat. *æquus*, equal + *angulus*, angle). A figure is said to be equiangular if all of its angles are equal, as is the case with the angles of a square or a regular polygon. Triangles which are mutually equiangular are called similar; but other mutually equiangular polygons are not similar unless their corresponding sides are proportional. (See SIMILARITY.) A polyhedron is equiangular when all its polyhedral angles are equal, as is the case with the angles of a cube. A spiral (q.v.) is called equiangular when the angle included between any radius vector and the tangent at its extremity is the same in all cases. This is the characteristic property of the logarithmic spiral.

EQ'UIDÆ (Neo-Lat. nom. pl., from *equus*, horse), or SOLIDUNGULA. The horses, a family of hoofed mammals of the suborder Perissodactyla, containing only a small number of species, which so nearly resemble each other that most zoölogists agree in referring them to one genus, *Equus*, though some have put the asses in the separate genus *Asinus*. They are distinguished from other quadrupeds by the concentration of the foot and toes, or the extraordinary development of the middle toe, which thus carries the whole weight and is incased in a bootlike hoof. There are, however, two small protuberances ("splint" bones) on each side of both the metacarpal and metatarsal, or "cannon" bones, which represent the former existence of other toes. The Equidæ have six incisors in each jaw, and six molars on each side in each jaw; the males have also two small canine teeth in the upper jaw, sometimes in both jaws, which are almost always wanting in the females. The molars of the Equidæ have square crowns, and are marked by the laminæ of enamel with ridges forming four crescents. The wearing down of these develops different patterns at different ages, by the examination of which, in the incisors, a person may determine with considerable accuracy the age of a horse. (See Plate illustrating this under HORSE.) There is a wide space between the canine teeth and the molars. The stomach of the Equidæ is simple, but the intestines are long, and the cæcum extremely large; the digestive organs thus exhibiting an adaptation, very different from those of the ruminants, to the same kind of not easily assimilated food. Another distinctive peculiarity of the Equidæ is that the females have two teats situated on the pubes, between the thighs. The Equidæ are now found in a truly wild state only in Asia and Africa. Fossil remains exist in the newer geological formations in great abundance in many parts of both the Old World and the New; and the whole evolutionary history of the Equidæ has been admirably worked out. (See HORSE, FOSSIL.) The horse and the ass are by far the most important species of this family. The quagga is extinct. The zebra seems incapable of useful domestication. Some attempts have been made, however, to cross zebras with horses in the hope that the hybrid might be able to withstand the attacks of the tsetse fly (q.v.) in South Africa; but though the hybrids are easily obtained and seem hardy, they cannot survive the bites of that terrible scourge. See ASS; HORSE; MULE; QUAGGA; ZEBRA.

E'QUILIB'RIUM, MECHANICAL (Lat. *æquilibrium*, level position, from *æquus*, equal + *libra*, balance). The condition of a body or of a system of bodies when there is no change in its motion; i.e., there is no acceleration of any kind, either of translation or of rotation. The mathematical conditions are, therefore, that the resultant force in any direction is zero, and that the resultant moment of the forces around any axis is zero. Equilibrium is called stable, unstable, or neutral, depending upon the consequence of giving the body or system of bodies a small impulse; if the change which results from this impulse is decreased by the forces called into action by the motion, the equilibrium is stable; if it increases, the equilibrium is unstable; if it remains unchanged, it is neutral. Thus, a body suspended at rest by a string is in stable equilibrium; a knife balanced on its point is in unstable equilibrium; a sphere lying on a smooth horizontal table is in neutral equilibrium. The use of the word "equilibrium" is extended also so as to include the condition of no apparent change in many other cases. A liquid is in equilibrium with its vapor if there is no longer any apparent evaporation or condensation. Thermal equilibrium is the condition when there is no longer any change in temperature. See MECHANICS.

E'QUIMUL'TIPLE. See MULTIPLE.

EQUINE ANTELOPE. A book name for either the roan or the sable antelope (qq.v.). See BLAUBOK, and Plate of ANTELOPES.

EQUIN'IA. See GLANDERS.

E'QUINOC'TIAL (Lat. *æquinoctialis*, from *æquinoctium*, equinox, from *æquus*, equal + *nox*, night). The celestial equator. (See EQUATOR, CELESTIAL.) The equinoctial points are those in which the equinoctial and the ecliptic intersect. See ECLIPTIC.

EQUINOCTIAL STORM, or GALE. For at least 300 years past, whenever a severe storm occurs on the Atlantic coast of North America or Great Britain at the season of the equinox, either autumnal or vernal, it has been spoken of as "the equinoctial storm" or gale, and there has sprung up a popular belief that such a severe storm is due at or near the date of the equinox. The fact is, however, that the stormy season of the year over the North Atlantic begins with August and continues with increasing severity until March or April, and there is no special day or period more likely than another to be stormy. Of course numerous severe storms are recorded near these dates, such as those of Sept. 20, 1676; Oct. 20, 1770; Sept. 23, 1815; Oct. 2, 1841; Oct. 7, 1849, and Sept. 8, 1869, all of them along the American coast; but it will be noticed that these dates have no close connection with the equinoctial date—September 22—and there are not more than a dozen such in the course of 200 years. The equinoctial storm is therefore simply a name given to the heaviest storm that happens to occur within a few weeks of the date of the equinox. For statistical details, consult: *Quarterly Journal Royal Meteorological Society* (London, 1884); *United States Monthly Weather Review* (Washington, 1891–1914); Loomis, *Treatise on Meteorology* (New York, 1871, last ed. 1883).

E'QUINOX'ES. Sometimes the equinoctial points (see EQUINOCTIAL) are called the equinoxes. More commonly, by the equinoxes are meant the times when the sun passes those points, viz., March 21 and September 22, the former being called the vernal or spring equinox, and the latter the autumnal. When the sun is in the equinoxes, the days and nights are of equal length all over the world. At the vernal equinox the sun is passing from south to north, and in the Northern Hemisphere the days are lengthening; at the autumnal, he is passing from north to south, and the days are shortening. As the earth moves more rapidly when near the sun, or in winter, the sun's apparent motion is not uniform, and it happens that he takes longer to pass from the vernal to the autumnal equinox than from the latter to the former. The equinoctial points are not stationary, on account of precession (q.v.). See ECLIPTIC.

E'QUIPOL'LENT (Lat. *æquipollens*, from *æquus*, equal + *pollere*, to have power). A term which, applied to lines, signifies equal in length and parallel in direction. There is a special geometry of such lines called the geometry of equipollence. This term was used in algebra by Chuquet (1484) to designate equivalent expressions.

EQ'UISETA'CEÆ AND **EQ'UISETA'LES.** See EQUISETUM.

EQ'UISE'TUM (Neo-Lat., from Lat. *equisætum, equisætis, equiseta*, from *equus*, horse + *sæta*, bristle), HORSE-TAIL RUSH, or SCOURING RUSH. The only living genus of the order Equisetales. This order is one of the great divisions of the Pteridophytes, the most conspicuous of the other orders being the ferns (Filicales) and the club mosses (Lycopodiales). The genus *Equisetum* is represented in the living flora by about 25 species, which are the lingering remnants of an extensive display that was a conspicuous feature of the flora of the Carboniferous and Mesozoic. The living forms are mostly small and inconspicuous, but they are very characteristic in appearance. The stem is slender and conspicuously jointed, the joints separating easily; it is also grooved and fluted by small longitudinal ridges, and there is such an abundant deposit of silica in the epidermis that the plants feel rough. At each joint there is a sheath of minute leaves, the individual leaves sometimes being indicated only by minute teeth. Since these leaves contain no chlorophyll and evidently do not function as foliage leaves, the chlorophyll work is carried on by the green stem, which is either simple or profusely branched.

One of the distinguishing features of the group is that they have distinct, spore-bearing leaves (sporophylls), and that these are arranged so as to form a conelike cluster, or strobilus. Each sporophyll in the strobilus consists of a stalklike portion bearing a peltate expansion. Beneath this shieldlike expansion hang the spore cases (sporangia), usually ranging from 5 to 10 in number. The spores produced are all alike, so that the group is not one of those in which heterospory (q.v.) occurs at present, although it is suspected that some of the ancient members of the group were heterosporous. The spores have a very interesting structure. In addition to the two coats common to spores, there is a third outer one consisting of two intersecting spiral bands which are attached to the spore only at their point of intersection. On drying, the spiral bands loosen and become uncoiled, and when moistened they close again around the spore. By means of these movements they serve to hook together the spores, and in this way the close proximity of germinating spores is secured. The significance of this proximity lies in the fact that the sexual plants (gametophytes) which the spores produce are unisexual—i.e., one plant produces the male organs (antheridia), and another produces the female organs (archegonia), a condition called diœcism (q.v.).

Fossil Forms. Fossil remains of Equisetales are found abundantly throughout the Paleozoic and Mesozoic of all countries. During the Paleozoic, in both the Devonian and Carboniferous, there occurred a great plexus of *Equisetum*-like forms, the whole assemblage being known in general as the Calamites. These forms are known mostly from pith casts, and all of them show the peculiar habit of *Equisetum*, with its jointed and fluted stem and whorled leaves. Among this plexus of forms the ancestors of *Equisetum* occur. An interesting feature of many of the Paleozoic Equisetales is that the leaves were large and functional, so that the Equisetums of to-day represent forms whose leaves have lost their ordinary function. There are also numerous detached cones (strobili) belonging to the Equisetales. Many of the Paleozoic forms were huge trees, sometimes reaching a height of at least 100 feet, the Calamites thus representing a conspicuous feature of the forest vegetation of the Paleozoic. During the Mesozoic the order was also well represented by forms intermediate between the Paleozoic Calamites and the modern *Equisetum*. For illustration, see Plate of Pteridophytes. Consult: Solms-Laubach, *Fossil Botany* (Oxford, 1891); Zittel, Schimper, and Barrois, "Traité de paléontologie," part ii, *Paléophytologie* (Paris, Munich, and Leipzig, 1891); Scott, *Studies in Fossil Botany* (London, 1909).

EQUITABLE ASSETS. Property of a debtor or decedent which cannot be reached by legal process, but which will be applied by equity to the payment of debts. Originally only property held by the debtor or his personal representative by a legal title was applicable to this purpose, and in the earliest period of our legal history the rights of creditors were confined to the personal property so held. Subsequently a testator might, by charging his real estate with the payment of his debts, or by directing his executor to sell his lands for that purpose, render such property liable in equity to the claims of his creditors. This did not have the effect of merging them in his general assets and of subjecting them to legal process; but it made them equitable assets, subject to the order of the Court of Chancery. This distinction has now been swept away in England and in the United States by statute. See Decedent.

The expression "equitable assets" is now applied to any equitable property rights of a debtor which can be reached by creditors only by a proceeding in equity. Most equitable interests—though there are some important exceptions—have been subjected by statute to the claims of creditors; but it is manifest that such an interest—as the rights of a beneficiary of a trust, e.g.—cannot be reached by the ordinary legal process of an execution or attachment. The creditor has resort, therefore, to a proceeding in equity known as a "creditor's bill." In a few American jurisdictions a statutory process has been devised for enforcing creditors' rights against either or both forms of property without distinction. See Assets; Equity; Equitable Estate.

EQUITABLE ASSIGNMENT. A transfer of the beneficial interest in property, real or personal, or of a claim or demand, the legal title to which remains vested in the transferror. It is effected by any transaction, as a defective legal assignment or even a mere agreement, whereby the owner of such property seeks to assign his interest therein to another, and it may operate even to vest in another the substantial control over property which is not assignable under the technical rules of the common law. The equitable mortgage (q.v.) is an illustration of the former, and the transfer of a right of action is a characteristic example of the latter.

A formal deed is necessary to the creation or legal transfer of an interest in land, and in the absence of a bill of sale a delivery of a chattel is requisite to vest the title thereto in the transferee; but the courts of equity will protect the interests of such a grantee who has parted with a valuable consideration in reliance upon it, even where the strict legal formalities have been omitted. This it does by compelling the execution of a valid conveyance or by vesting in the grantee the rights of an owner. In the same way the attempted transfer of property not at the time in existence, or not yet acquired by the vendor or mortgagor, is regarded in equity as a valid assignment of the transferror's future interest therein, which becomes complete upon his subsequent acquisition of the title. See Estoppel.

Equity will also interfere to protect the assignee of a chose in action (q.v.) and permit him to prosecute the action for his own benefit, but in the name of his assignor, who at common law was still considered the owner of the claim and the rightful party in interest. This awkward device for securing the assignability of rights of action is still employed in many of the United States, though it has in others been rendered unnecessary by statutory provisions rendering such rights freely assignable at law.

An equitable assignee takes the assigned property as it is, subject to all claims, set-offs, or liens, whether legal or equitable, to which it is subject at the time of the transfer. See Equity; Equitable Estate.

EQUITABLE DEFENSE. A defense in an action or legal proceeding which is cognizable by a court of equity, as distinguished from a court of law. Thus, in an action on a promissory note, the defense of want of consideration is a *legal defense*, as tending to relieve the maker thereof from his liability on the contract; but the defense of fraud, being an allegation of extraneous matter, did not affect the legal liability, but was an *equitable defense* and involved an appeal to equity jurisdiction. Under the old practice, by which the limits of common-law and equity jurisdiction were strictly defined, equitable defenses were not available in a court of common law. As early as 1854 in England it was enacted that such defenses might in many cases be pleaded in a court of common law, and such pleading did not debar the defendant from afterward applying for appropriate relief to a court of equity. The same permission is given by the codes and procedure acts in most of the American States. With very few exceptions, what were formerly equitable defenses may now be put forward, both in the United States and in England, in the same action and simultaneously with strictly legal defenses. See Equity; Procedure.

EQUITABLE EASEMENT. A right to control or restrict another, by injunction or other equitable process, in the lawful use of his land. This right arises under a variety of circumstances, but usually where the owner of a parcel of land enters into a restrictive covenant as to his use thereof with a neighbor—as that he will not build within a certain distance of the street line; that he will not maintain a stable, a tavern, or other objectionable occupation thereon. Such a covenant is enforceable at law against the maker of it; but as no burden can be imposed upon land by covenant, and as such a restriction cannot, however created, be recognized as a legal easement, it becomes inoperative as soon as the land is conveyed away by the covenantor to a stranger. If, however, the covenantor bound his heirs and assigns, as well as himself, to the performance of the agreement, the courts of equity will restrain a violation of it, not only by the covenantor himself, but by his heir, his devisee, or grantee without consideration, and by any assign who takes the land with knowledge of the covenant. As in the United States the recording of a deed is constructive notice of its contents to all subsequent purchasers of the property, this equity jurisdiction creates in this class of cases a right analogous to that known as an easement at law. The phrase "restricted land" and "restrictive covenants," in common use in connection with city and suburban property, have reference to the existence of such equitable easements.

Though the exercise of this jurisdiction is closely limited to agreements which are of a restrictive character and which impose no active duty upon the owner of the land affected, it has in recent years been greatly expanded so as to include cases in which there was in fact no covenant, but only a general, but perfectly clear and definite, understanding among the various owners of a tract of land as to the uses to which it should be devoted. Accordingly, if land is subdivided and sold in parcels in accordance with a general scheme or plan, all who buy with notice of the restrictions contained in such plan are bound thereby. See COVENANT; EASEMENT; EQUITY; RESTRICTIVE COVENANT.

EQUITABLE ESTATE. An interest in property of such a nature that its enforcement and protection are within the jurisdiction of the courts of equity and not of common law: the right to the beneficial use and enjoyment of property without the legal estate. It is only by a considerable extension of the technical meaning of the term "estate" and by analogy that it can be applied to a right of this character. In the primary classification of legal rights as rights in rem and rights in personam—i.e., rights in a definite object (in rem certam) available against the whole world, and rights available against a particular individual only—property rights form by far the largest, if not the most important, body of rights of the former class. A freehold estate in lands, e.g., is not, like a claim founded upon contract, a right against a certain, definite person, but involves the assertion of an exclusive title and right of possession against any and everybody who may choose to dispute it. Such rights as these are fully recognized and protected by the courts of common law, by putting the rightful claimant in possession of the property and by defending such possession against all comers, and they are thus appropriately described as legal estates.

The corresponding equitable right, on the other hand, is not, in our legal system, a right in rem, but only in personam. The beneficiary of the right cannot claim the possession of the property to which it relates, and a trespass upon it is not an injury to him, but to the trustee or other person in whom the right in rem, the legal title, is vested. The remedy of the beneficiary is confined to the latter, in personam, whose administration of such legal estate he is entitled to supervise and control. Clearly such a right as this lacks the character of property, or of an estate, in the strict sense of those terms. But the expressions "equitable estate" and "equitable property" have been found too convenient to be dismissed on technical grounds and must now be regarded as permanent additions to our legal nomenclature; in addition to which, the recent fusion of law and equity jurisdiction in England and many of the United States has tended to make the distinction between legal and equitable interests less important.

The origin of equitable estates is to be found in the ancient practice of conveying lands to the use of a person other than the grantee, which prevailed in England in the fifteenth and sixteenth centuries. By the Statute of Uses, enacted in the twenty-seventh year of Henry VIII (1535), this practice, which had become so general as to involve most of the lands in the kingdom, was much curtailed, and the system of trusts, as we know them, established. These constitute at the present time by far the greater part of the class of interests known as equitable estates. Rights of an analogous character arise under a great variety of circumstances. Whenever one person has the legal title to property, real or personal, and another is entitled by the aid of equity to compel the conveyance of the property to himself or its administration for his benefit, the latter has an equitable estate therein.

Such a right arises in every case where an unexecuted agreement exists for the conveyance or mortgaging of land, or where an attempt to make such a conveyance or mortgage fails through the defective execution of the instrument of assignment. The right to the specific performance of the contract in the one case, and to compel the due execution of the instruments in the other, whereby the legal title to the property shall be transferred to the beneficiary, constitutes his equitable estate therein. Similar in character is the right known as the *equity of redemption*, whereby a mortgagor is enabled, after the forfeiture of his mortgage, to redeem the mortgaged land or goods from the mortgagee. The legal title having, by the forfeiture, become completely vested in the latter, the right of redemption preserved by equity to the mortgagor may properly be regarded as a form of equitable estate. The large class of interests of this character known specifically as constructive trusts will be described under the title TRUST. See also EQUITABLE EASEMENT; EQUITY; USES.

EQUITABLE MORTGAGE. A lien created on property, either real or personal, without transferring the title thereto to the person intended to be secured. It is of the essence of the mortgage proper in the common-law system that the legal title to the property mortgaged shall pass to the creditor and remain in him until payment or foreclosure. But the equity tribunals have given the effect of a mortgage to a variety of transactions in which no property is actually transferred, but where it is the intention of the parties that it shall be pledged or subjected to a lien in favor of the creditor, in order to secure the payment of his claim.

The most striking example of the equitable mortgage is the lien upon land created by the deposit of title deeds to secure a loan or other obligation. This is in common use in England and occurs occasionally in a few of the United States. Everywhere, however, a mortgage deed which, through defective execution, fails to take effect in the manner intended, is treated as creating an equitable mortgage, and the same effect is given to any written agreement for a mortgage intended to have a present effect. An oral agreement to subject land to a mortgage lien is only prevented from producing a similar result by the Statute of Frauds, which renders void all agreements concerning lands which are not committed to writing: but under some circumstances effect is given by courts of equity even to these.

Similar to mortgages arising out of mere written agreements, as distinguished from conveyances, is the familiar security known as the mortgage on after-acquired property, as upon a fluctuating stock of goods in a store, upon machinery to be added to the equipment of a mill or factory, upon the future rolling stock of a railroad, etc. The familiar rule that no one can grant that which he does not have deprives such mortgages of any common-law validity beyond the property actually possessed at the time of the transaction. As to the property described in them which is afterward acquired by the mortgagor, the description operates only as an agreement to subject it to the lien as and when it becomes the property of the mortgagor. There is considerable diversity of judicial opinion as to the effect of such a mortgage; but the prevailing view, which obtains in England and in most of the United States, is that it creates an equitable mortgage on the after-acquired property valid as against the mortgagor, his heirs and creditors, and against purchasers with notice or without consideration. In New York a curious intermediate doctrine has been worked out by the courts, the property being protected against purchasers with notice, and such as acquire the property without consideration, but not against the claims of attaching creditors. Railroad mortgages on after-acquired property, whether real or personal, are, by reason of their exceptional character, universally held to be valid, even in jurisdictions in which such mortgages, as between private individuals, are not generally recognized.

As already indicated, in all cases of equitable mortgage the legal title to the property remains in the mortgagor, as well as the right of possession, the interest of the mortgagee being a mere lien which is enforceable only in equity and which is not protected by any common-law process. But as such a mortgage has, in general, priority over the claims of creditors of the mortgagor, as well as over the rights of subsequent purchasers and mortgagees, with notice, and as the recording of such an instrument under the recording acts in the United States gives constructive notice to all intending purchasers and lienors, it furnishes adequate security to creditors intended to be protected thereby. Strictly speaking, the remedy by foreclosure, which is the usual and proper process for the enforcement of a legal, or ordinary, mortgage, is not appropriate to a mortgage of this type. It is enforced by a bill in equity praying for the sale of the property under the authority of the court and for the payment of the mortgage debt out of the proceeds. As this process does not differ materially from the modern statutory proceeding employed in New York and some other States to foreclose a legal mortgage, the term "foreclosure" is, in such jurisdictions, also applied to it. See Equitable Estate; Foreclosure; Mortgage; and the authorities cited under the last of these titles.

EQUITES, ĕk′wĭ-tēz. See Equestrian Order.

EQ′UITY (Lat. *æquitas*, fairness, equality, from *æquus*, fair, equal). In law, a term sometimes used as synonymous with natural justice, as distinguished from the fixed and technical rules of law. In its technical sense the term signifies the system of jurisprudence originated and applied by the English Court of Chancery, and in the United States applied by various courts exercising a similar jurisdiction.

Equity jurisprudence, as a whole, comprises many unrelated rules and doctrines which, however, present a certain homogeneity due to three important factors common to their development, as follows: (1) their common source; (2) the kind of relief afforded, the court of chancery acting in personam, as distinguished from the courts of common law, which act in rem; (3) the object of, or rather the occasion for, the system. This occasion was the necessity of mitigating the rigor of the common-law system by preventing the inequitable application of rules of law and by affording a remedy when there was no remedy at law, or when the legal remedy, if any, was inadequate. The rights recognized, and corresponding remedies provided, by the English court of common law were early restricted to those obtainable by a limited number of forms of action of a fixed character. See Common Law; Law; Pleading.

Even in cases where there was a remedy at common law it was frequently inadequate, owing to the fact that the common-law courts could award only the recovery of a sum of money or of specific real or personal property. They were powerless to prevent a threatened injury or to compel a defendant to perform a legal duty. Another source of difficulty was the fact that all actions at law were necessarily two-sided controversies, in which the judgment rendered must be either for a plaintiff or a defendant. The law courts were without the machinery for the settlement of a controversy in which several parties with distinct interests were involved. The Chancellor (Keeper of the King's Conscience), as administrator of justice upon conscientious grounds, and invested with the King's prerogative to issue orders or decrees directing the doing of an act, possessed all the requisite power to remedy these defects of the common law. The Chancellor could and did command things, other than the payment of money, to be done. He could summon before him all the parties to a controversy, however numerous, and in a single proceeding determine and adjust the rights of all. It is upon these simple but fundamental distinctions that the differences between the law and equity systems are based. While the discretion of the Chancellor was originally as wide as his sense of justice, the principles of equity jurisprudence early took on definite form, and were embodied in decisions which have substantially the same force as precedents as the decisions of the courts of common law. These principles are now for the most part fixed, and can only be changed by legislative action. For further discussion of the development of equity jurisdiction, see Chancery.

From the very nature of equity jurisprudence it follows that the jurisdiction of courts of equity is as extensive and as diverse as that of the courts of law whose remedies it was the aim of equity to supplement. It also follows from the supplementary character of equity that, as a prerequisite to the exercise of its jurisdiction, there should be no adequate remedy at law, which may result from the fact either that the legal remedy, because of its nature, cannot effect complete justice or that there is a right which courts of equity recognize and for which they will grant relief, but for which there is no legal remedy of any kind.

The jurisdiction of equity may be classified with reference to the jurisdiction of courts of law as (*a*) concurrent, (*b*) supplementary or auxiliary, (*c*) exclusive. Jurisdiction is said to be *concurrent* where courts both of law and equity have jurisdiction over the subject matter but the exercise of jurisdiction by one court excludes the exercise of jurisdiction by the other. Thus, in case of breach of contract, the injured party may seek to recover damages at law, or, in a proper case, he may seek specific performance of the contract in equity, the choice of one remedy excluding resort to the other. Jurisdiction is *supplemental* when it affords a remedy in addition to, but not exclusive of, a legal remedy. Thus, the right of the mortgagor to redeem in equity and the jurisdiction of equity over legal waste are examples of supplemental jurisdiction. Jurisdiction is *exclusive* when equity affords relief in cases where there is no corresponding legal remedy; or, stated in different terms, when equity recognizes and protects a right which is not recognized at law, as in case of trusts, equitable easements, and equitable waste.

A comprehensive view of equity can best be obtained by an examination of the various forms of relief afforded by the court of chancery. These forms of relief may be roughly classified as (*a*) preventive and (*b*) remedial.

Courts of equity most frequently exercise their jurisdiction to prevent threatened injuries to property or analogous interests by means of an injunctive decree or order commanding the defendant to refrain from committing the threatened injury, or commanding him to do some act which would prevent the injury. The most common forms in which preventive jurisdiction is exercised are (1) bills to restrain the commission of tort, (2) bills of peace, (3) bills of interpleader, and (4) bills quia timet—in all of which the common ground for exercising jurisdiction is the prevention of threatened injury to the plaintiff, for whom there is no adequate legal remedy.

(1) *Bill to Restrain the Commission of a Tort.*—As a general rule, equity will restrain the commission of any tort which would result in injury to property and for which legal damages would not be an adequate remedy. Inadequacy may exist either because the damage is irreparable—i.e., the property could not be repaired or replaced by the sum received as damages, as, e.g., injuries to growing trees, or to a work of art, or to one's business; or the inadequacy may arise from the fact that the defendant (in equity) threatens to repeat a tort so frequently that the plaintiff will be compelled to resort repeatedly to a court of law to recover damages, in which case equity will restrain the commission of the tort. Thus, equity will restrain the defendant from trespassing repeatedly on the plaintiff's land, although legal damages for a single trespass would be adequate. Upon the principle of preventing irreparable injury to a property interest, equity will enjoin the publication of a trade secret belonging to the plaintiff, or of a private letter written by him.

Equity will not restrain a libel or slander, or the commission of a crime as such, though the mere fact that a threatened injury to property is also a crime will not prevent the exercise of equity jurisdiction. This self-limitation of jurisdiction is somewhat arbitrary, and in England and in most States courts of equity now have statutory jurisdiction to restrain the publication of trade libels.

(2) *Bill of Peace.*—The object of bills of peace is to relieve the plaintiff from the burden of litigating a multiplicity of suits, either in law or equity. Thus, when one is compelled to bring or defend numerous actions at law or in equity in order to establish his right, a court of equity may issue an injunction restraining all the separate actions, and compelling the parties to try them all in equity in a single proceeding; or it may enjoin all the actions at law but a single one, and upon its conclusion adjust the rights of all parties in accordance with the result so obtained. The same relief may be obtained by the several plaintiffs or defendants in numerous actions at law or in equity who may unite in asking it.

(3) *Bill of Interpleader.*—The object of the bill of interpleader is to release the plaintiff from the demands of several parties all claiming of him payment of the same debt or performance of the same obligation. He is in the position of a stakeholder who is willing to pay over a sum of money to the proper party, but is unable to determine who is the proper party. Thus, payment is demanded of A (the maker of a promissory note) by both B and C, who claim to be owners of the note. Upon A's offering to pay the money into court and disclaiming any interest therein, equity will enjoin B and C from proceeding against A, and compel them to litigate the question of ownership of the note in equity. See INTERPLEADER.

(4) *Bill Quia Timet.*—The object of the bill quia timet is to compel the surrender and cancellation of an instrument upon which, although invalid, the holder might at some future time found an action at law or in equity against the plaintiff. The relief is granted upon the theory that through lapse of time the plaintiff might lose the evidence of the invalidity of the instrument and thus be subjected to an action after his defense to it is lost. This form of equity jurisdiction is clearly related to bills to remove cloud on title. See QUIA TIMET.

Jurisdiction in which the relief is remedial is characterized by various forms of relief which seek, not to prevent threatened injuries, but rather to provide remedies for past wrongs more complete than the legal remedy, if any, or seek to confer upon the plaintiff rights not recognized at law. Owing to the diverse character of these various forms of jurisdiction, it is impossible to classify them in a scientific manner. They may, however, be roughly grouped as follows:

I. Jurisdiction affecting contracts and analogous rights. II. Jurisdiction affecting title or other interests in real property. III. Jurisdiction in aid of actions at law.

I. *Jurisdiction Affecting Contracts and Analogous Rights* may be again roughly classified as follows: (1) specific performance of contract; (2) reformation and rescission of contracts and deeds; (3) marshaling; (4) subrogation; (5) creditor's bills; (6) bills for an account; (7) bills to compel contribution. Of these it may be observed that in each case the relief granted may, and frequently does, affect incidentally title or other property interests. In each case, however, the basis of equitable action is the protection or enforcement of a contract or analogous right.

(1) *Specific Performance of Contract* will be compelled by equity when legal damages for the breach of contract would be inadequate. And, given a case when equity would compel performance of a contract by one party to it, it

will—upon the so-called doctrine of mutuality—compel performance by the other, although his performance consists merely in the payment of a sum of money. Equity will not, however, compel performance of contract of a purely personal nature, as a contract to marry or to form a partnership; nor will it compel performance of contracts which would require the active supervision of the court over the performance, as a building contract.

(2) *Reformation and Rescission.*—Equity exercises its jurisdiction generally over contracts and deeds to make them conform to the intention of the parties. Whenever a term of a written contract is incorporated in or omitted from it by mistake, equity will compel a reformation, or, more properly, a reëxecution of the contract in accordance with the intention of the parties. Where a contract is tainted with fraud, or there is a mistake preventing a meeting of the minds of the parties, a court of equity will declare the contract rescinded, and compel its cancellation by the parties to it. (See FRAUD; CONTRACT.) Upon similar principles, equity will sometimes compel the execution of new documents to replace lost documents which are necessary to support a claim of title. See REFORMATION; RESCISSION.

(3) *Marshaling* in equity is rather a general doctrine or rule of procedure than a specific form of relief. Briefly stated, the doctrine is that he who has two funds available to satisfy his demand shall not by his election to resort to one fund deprive another of his security who has only one of the two funds to satisfy his demand. Thus, in the case of suretyship, if one of the two sureties holds collateral security for his contract of suretyship, although both, on payment of the principal debt, are entitled to the security of the creditor's obligation, equity will compel the first to resort to his collateral security in order not to deprive the other of the benefit of the creditor's security. See MARSHALING; SURETYSHIP.

(4) *Subrogation* is also an equitable doctrine rather than a specific form of relief, and not one of universal application. In certain cases equity will, for the purpose of working out justice, treat one who has paid the debt of another as an assignee of the debt or claim, in which case he is said to be subrogated to the other's rights in such debt or claim. Thus, one who has loaned money to a corporation under an ultra vires contract, for the purpose of paying lawful debts of the corporation, may in equity be subrogated to the claims of those creditors whose claims are so paid, in order to avoid the injustice of denying him a recovery of the money loaned on the ground of the invalidity of the agreement. See SUBROGATION.

(5) *Creditor's Bills* are available to compel the reconveyance of property conveyed by a judgment debtor in fraud of his creditors or to subject to the creditors' process property—such as the debtor's interest in a trust estate—which is not subject to attachment or execution at common law.

(6) *Account.*—Equity will, in a proper case, compel a defendant to state an account to the plaintiff and then compel payment of the amount so found to be due. (See ACCOUNT.) This relief may be obtained on the ground that the defendant is a trustee or fiduciary, who is peculiarly the subject of equity jurisdiction, or that the account is too involved and complicated to be properly dealt with by a court of law. This form of relief is to be distinguished from the now obsolete action of account at common law.

(7) *Contribution.*—Equity will, in a proper case, when one of several parties having a joint obligation has paid the obligation, compel the others to contribute pro rata to the payment. This doctrine is most frequently applied among cosureties, but has a more extensive application; and in some cases is applied among parties who at law have not incurred a joint obligation, but who on equitable principles are treated as though their undertaking were joint.

II. *Jurisdiction Affecting Titles or other Interests in Property* may be classified as follows: (1) bills to remove cloud on title; (2) partition; (3) bills to foreclose or redeem a mortgage; (4) bills to enforce liens; (5) jurisdiction over uses and trusts.

(1) *Bill to Remove Cloud on Title.*—Equity exercises its jurisdiction to compel the cancellation of any invalid document or record which, because of its apparent validity, creates a cloud, or apparent defect, in the title of the plaintiff. This form of relief is analogous to that granted upon bills quia timet. Strictly, however, the relief granted is not for the purpose of preventing a future attack upon the plaintiff's title, but for the purpose of aiding the plaintiff to secure a present marketable title to his real estate.

(2) *Partition.*—Equity early took jurisdiction to compel a partition of real estate held by joint tenants or tenants in common on the petition of any of them. It might accomplish this result by a division of the land among the several tenants by means of mutual conveyances, or by directing a sale of the land and a division of the proceeds.

(3) *Bill to Foreclose or Redeem a Mortgage.*—This was one of the early forms of supplementary jurisdiction and is a typical example of the growth and development of the equity system. See EQUITY OF REDEMPTION.

(4) *Bill to Enforce a Lien.*—At common law the various forms of lien gave the lien holder the right only to retain possession of the property which was subject to the lien. He could make no use of it, nor could he dispose of it in order to satisfy his claim. Equity exercised its jurisdiction to enforce such liens by judicial sale of the property, unless the defendant before the decree paid the amount due upon the lien. Equity also recognizes and enforces as liens mere agreements for a lien or mortgage which fall short of creating a common-law lien. See EQUITABLE MORTGAGE.

(5) *Jurisdiction over Uses and Trusts.*—Although this form of jurisdiction is in many ways analogous to the jurisdiction of equity over contract rights, its basis is the obligation which equity imposes on the trustee to hold the legal title of property for the benefit of another. For the purpose of effecting this result, equity compels the trustee to do any requisite act. It may compel him to convey the trust property or to account for its proceeds. It regards the interest of the beneficiary as analogous to a property interest at law and as subject to analogous rules of devolution. See EQUITABLE ESTATE; TRUST.

III. *Jurisdiction in Aid of Actions at Law.*—In two classes of cases equity came to the assistance of parties to actions at law. The assistance was rendered by means of (1) bills of discovery and (2) bills to perpetuate testimony.

(1) *Bill of Discovery.*—It often happened that a party to an action at law was unable (either because of the rules of evidence or because of his inability to secure evidence in advance of a trial) properly to prepare his case for trial or to prove his case at the trial. Equity came to his aid by compelling the defendant, in a proper case, to "make discovery" of the matter relevant to the trial at law. The effect was to compel the defendant to give to the plaintiff (in equity) the information which he sought, and to supply him with "admissions" made by the defendant, which could be used as evidence in the trial at law. See EVIDENCE.

(2) *Bill to Perpetuate Testimony.*—Equity early exercised its jurisdiction to take the testimony of witnesses to be used on the trial of an action at law. It might do this either on the ground that the witness was aged or infirm, and that his testimony might not be obtainable when it should be required for the trial at law, or because the plaintiff in equity, being a prospective defendant at law, feared that the plaintiff would postpone the action at law until the evidence was lost. This form of relief is analogous to bills quia timet, but is remedial rather than preventive.

Owing to the changes in rules of evidence and the various statutory forms of commission to take testimony, both bills of discovery and bills to perpetuate testimony are now generally obsolete, though they are still occasionally employed.

In the development of equity jurisprudence, certain maxims adopted by courts of chancery have played a considerable part. Frequent reference to these in the opinions of equity judges, as apparent rules of decision, has perhaps given them undue importance. Properly they are not fixed rules of general application, but rather apt phrases which are indicative merely of general guiding principles having many special applications and exceptions. The scope of this article will not permit their extended examination, and it will be sufficient to enumerate some of the more familiar maxims. Thus:

He who seeks equity must do equity.

He who comes into equity must come with clean hands.

Equity aids the diligent, not the slothful.

Equity follows the law (indicating that whenever legal rules are applicable equity will follow them—e.g., the Statute of Limitations).

Where equities are equal the legal title will prevail.

A proceeding in equity is not begun by writ as in a common-law action, but by petition, or bill, praying that a subpœna issue to the defendant compelling him to answer. The final relief granted by the court is embodied in an order or decree. The court of equity may grant any appropriate interlocutory relief. Consult: the commentaries of Blackstone and Kent; the authorities referred to under JURISPRUDENCE; and such special treatises as Pomeroy, *Treatise on Equity Jurisprudence as Administered in the United States* (3d ed., San Francisco, 1905); Bispham, *Principles of Equity* (7th ed., New York, 1905); Bigelow, *Elements of Equity* (Boston, 1899); White and Tudor, *Leading Cases in Equity* (7th ed., London, 1897); Kelke, *An Epitome of Leading Cases in Equity* (London, 1901).

EQUITY, Courts of. See CHANCERY.

EQUITY OF REDEMPTION. The estate or interest which the mortgagor retains in mortgaged property. In strict legal theory, the expression has reference only to the right of the mortgagor to compel the redemption of the mortgaged property after forfeiture and after the title of the mortgagee has become absolute at law; but in practice the term is employed by lawyers as well as in popular speech to denote the residuum of interest left in the mortgagor after the making of the mortgage.

The legal effect of mortgaging property, whether real or personal, is to vest a defeasible title in the mortgagee, which, upon default of payment, becomes an absolute title at law. The common-law tribunals maintained the legal effect of the transaction with rigorous consistency, requiring the mortgagor to perform the condition of payment, upon which the conveyance had been made, to the letter. If he made his payment at the time and place specified, his title revived and the property became his again without a reconveyance. If he made default in payment on the "law day," the forfeiture was absolute and he was still liable to pay the debt in addition to losing the property. It was one of the earliest and greatest triumphs of the equity system to preserve to the unfortunate debtor the right to redeem his property, notwithstanding his default, by the subsequent payment of the debt with interest.

This innovation, which destroyed the legal effect of the forfeiture which had been incurred, was stoutly resisted by the common lawyers of the time, Sir Matthew Hale, when Chief Justice, declaring from the bench that by the growth of such equities the heart of the common law was eaten out. But the justice and humanity of the relief thus extended to the debtor were too obvious to permit a return to the system of forfeitures, and it soon became a recognized head of equity jurisdiction. Under this salutary system the mortgage has, both in law and equity, come to be considered merely a superior sort of lien, the mortgagor's equity of redemption representing for most purposes the real and substantial ownership of the mortgaged property. As such it may be conveyed, encumbered, or devised by the mortgagor; or it may be transmitted by descent to his heirs. It is liable for the debts of the mortgagor, like the rest of his property, and is, in the United States, subject to dower and curtesy.

Being thus an alienable estate, an interest in it may be acquired by any one to whom any estate or interest therein is granted, as a tenant for years, a subsequent mortgagee or other incumbrancer, the grantee of an easement, etc., as well as the heirs, devisees, and assignees of the mortgagor. Any person having such an interest has an equal right to redeem with the mortgagor himself. The mortgagee is not precluded from becoming the owner of the equity of redemption or of any interest therein by a purchase in good faith from any person having the right. The usual effect of such a conveyance to the mortgagee is to extinguish the equity and convert his defeasible title into an absolute title, though this result may be avoided if the intention of the parties or the interests of justice require that the equity be kept alive.

Originally the equitable right of redemption was unlimited in point of time, and this is still the case so long as the relation of mortgagor and mortgagee continues, unless it be cut off by the process known as foreclosure (q.v.), instituted by a bill in equity. This process (known in some States as a "strict foreclosure," to distinguish it from the statutory proceeding for the sale of the mortgaged premises, to which the name of foreclosure has also come to be applied) has the effect of extinguishing the right or equity of redemption and of converting the mortgagee's conditional estate into an absolute one. Other than some process of foreclosure, there is, as is said above, no way in which the right of redemption can be abridged so long as the relation of mortgagor and mortgagee continues. But if this relation is terminated by the mortgagee's adverse occupation of the land, without any recognition of the mortgage, for the statutory period of limitation, the equity of redemption may also be cut off by lapse of time. This period is usually 20 years, but in some jurisdictions a shorter period of limitation of 10 or 12 years is provided by statute for extinguishing an equity of redemption by the adverse possession of the mortgagee. In the absence of statutes of limitation the equity tribunals have in some cases refused to recognize the right to redeem where the mortgagor or other party claiming the right had neglected for an unreasonable time to exercise it.

Popularly the expression "equity of redemption" is often employed to denote the value of mortgaged property over and above the amount of the mortgage debt with the interest that may be due thereon. See Chancery; Equity; Forfeiture; Mortgage; Redemption; and consult the authorities referred to under the article on Mortgage.

EQUITY PLEADING. That part of the procedure of courts of equity, or chancery, wherein the claims of the several parties to a controversy entertained by such a court are set forth and defined. The equity system of pleading is derived in part from that of the courts of common law but in much greater measure from that of the ecclesiastical courts, which, in their turn, derived it from the civil law system of Western Europe. This was due in part to the fact that the early chancellors in England were ecclesiastics trained in the canon law, which was itself based on the civil law, and were ignorant of the common law and its procedure, but more to the nature of the remedies afforded in the equity courts and to the principles on which it exercised its peculiar jurisdiction. Thus as the appeal to chancery was based on the inadequacy of the justice afforded by the ordinary (common law) tribunals, it naturally took on the form of a humble petition addressed to the king, praying for the relief elsewhere denied. In the common law courts, on the other hand, the pleading by which the suit was instituted was a simple declaration setting forth the grievances which the plaintiff alleged against the defendant and a demand of the particular redress which the ordinary jurisdiction afforded. In the course of time, however, the pleading in the equity courts has become even more closely assimilated to that of the common law and has, accordingly, departed more and more from that of the ecclesiastical law. Moreover in modern times the equity system of pleading, like that of common law pleading, has been greatly simplified, so that it consists at present of three "regular" pleadings,—the petition of the complainant, known as the bill, the answer of the defendant, and the replication of the complainant. The earlier formal pleadings subsequent to the replication, as the rejoinder of the defendant, etc., have been merged in the three regular pleadings. Besides the regular pleadings, demurrers and pleas are also admitted in equity pleading. These were borrowed from the common law and retain essentially their common law functions. (See Demurrer; Plea.) The scope and flexibility of equity jurisdiction has given rise to a form of defense in chancery which is not possible in common law procedure, namely a counterattack by the defendant against the complainant, instituted by a cross bill. A familiar instance of this procedure is where a wife sues for a restitution of conjugal rights. The husband may set up, by way of defense, that she has been guilty of adultery, but he may also avail himself of the same fact as the ground of a cross action for divorce. In this way the whole issue can be tried in one and the same proceeding and the rights of the parties completely determined. See Bill; Cross Bill; Pleading; Procedure.

E'QUIV'ALENT (from Lat. *æquivalere*, to have equal value, from *æquus*, equal + *valere*, to have power). A term used in geometry, to signify equality of area or volume. Thus, two triangles are said to be equivalent, or equal in area, or simply equal, if they have equal bases and equal altitudes. But if they are also similar in shape, they are said to be congruent, or identically equal. In algebra, two equations are said to be equivalent when the roots of each equation completely satisfy the other equation; e.g., if the same quantity is added to or subtracted from the two members of an equation, the result is an equivalent equation, since any root of $A = B$ is also a root of $A \pm C = B \pm C$, and any root of $A \pm C = B \pm C$ is also a root of $A = B$. But, while $x^2 = 2x$ and $x = 2$ are equations each of which is directly derivable from the other, they are not equivalent equations, for $x = 0$ is a root of the first equation, but not of the second.

EQUULEUS, ē-kwōō′lē-us (Lat. a colt). A small northern constellation, lying almost on the equator, and surrounded by Pegasus, Aquarius, and Delphinus. Its chief objects of interest are the remarkable double star, δ *Equulei*, and the triple system, ε *Equulei*. The former has a parallax of 0.07″, corresponding to a distance of 46 light years, and is one of the most rapid binaries known, its period being 5.7 years.

E'RA. See Chronology.

ERAN', ERA'NIAN. See Iran, Iranian.

ERA OF GOOD FEELING. A term applied in American political history to the period 1817 to 1824, during which there was virtually only one party—the Democratic-Republican—in the United States. That party, however, was broken up into personal factions. At the close of the War of 1812 the Federalist party had passed almost entirely out of existence, and in 1821 President Monroe was reëlected by an electoral vote of 231 out of 232. The discussions over the tariff and internal improvements, however, soon caused new political alignments, and brought the "Era of Good Feeling" to a close. Different dates are given for the period by different writers on American history, some of whom restrict it to the second administration of Monroe.

ÉRARD, ā′rär′, Sébastien (1752–1831). A famous French piano and harp maker, born at Strassburg. He went to Paris, where the Duchess of Villeroy became his patron, and in her house he made the first piano ever manufactured in France. He became famous and with his brother established a large factory in Paris and a branch in London. Thenceforward devoting his life to the development of his favorite instrument, the pianoforte, he brought it to a perfection before unknown, his most famous invention being the repetition action, first applied in 1821. For the harp he invented the double-action mechanism. He died near Paris.

ERAS, ā'rȧs, Wolfgang (1843–92). A German economist, born at Schönfeld and educated at Leipzig, Jena, and Berlin. He was general secretary to the Rhenish-Westphalian Industrial Association from 1866 to 1870, in 1871 was appointed recorder of the Chamber of Commerce in Breslau, and in 1886 held the same position in the Textile Manufacturers' Association of Silesia. He was editor of the *Jahrbuch für Volkswirtschaft* in 1868–69. The following is a list of his more important publications: *Der Währungsstreit* (1883); *Einrichtungen für die Binnenschiffahrt an deutschen und holländischen Handelsplätzen* (1885); *Unser Handel mit den Balkanländern* (1891).

ERASED (from Lat. *erasus*, p.p. of *eradere*, to erase, from *e*, out + *radere*, to scrape) and Eradicated. Terms in heraldry denoting that an object is plucked or torn off and showing a ragged edge; as opposed to *coupé* or *coupy*, cut, which shows a smooth edge. A tree plucked up by the roots is said to be eradicated. See Heraldry.

ER'ASIS'TRATUS (Lat., from Gk. Ἐρασίστρατος). One of the most famous physicians and anatomists of ancient times. He was born at Iulis in the island of Ceos, the son of Cleombrotus and Cretoxene. He became the pupil of Metrodorus and Theophrastus and through Metrodorus was influenced by the views of Chrysippus. He traveled much and about 294 b.c. was body physician at the court of Seleucus Nicator, King of Syria. At a later time he resided at Samos, but, giving up practice, devoted himself to the study of the theory of anatomy at Alexandria. He was the rival of Herophilus. Erasistratus was the first to distinguish between the sensory nerves and the motor nerves and to trace both sets of nerves back to the substance of the brain. He also approached to the right view of the circulation of the blood in that he explained the origin of both the veins and the arteries as being in the heart. He held the strange view, however, that normally the arteries held only air, and that, when they were filled with blood, disease followed. He wrote many works on medicine and anatomy, of which we have a few fragments, preserved especially by Galen, and the titles of some 14 or 15. There was a sect of physicians who called themselves, from the name of their master, Erasistrateans. Consult: Hieronymus, *Erasistrati et Erasistrateorum Historia* (Jena, 1790); Susemihl, *Geschichte der griechischen Litteratur*, vol. i (Leipzig, 1892); Fuchs, "De Erasistrato Capita Selecta," in *Hermes*, vol. xxix (Berlin, 1894), and in *Rheinisches Museum*, vol. lii (Frankfurt a. M., 1897). See Medicine.

ERASMUS, ė-răz'mŭs, Desiderius (c.1466–1536). One of the greatest scholars of the Renaissance and Reformation period. He was born at Rotterdam, October 28, probably in the year 1466. The materials for the history of his life are scanty and doubtful, being taken almost entirely from his own writings. In spite of the obvious purpose of most of these materials to explain or to conceal matters of personal experience, they have been generally accepted by biographers as historical, and thus a kind of Erasmian legend has taken form, only partially cleared up by the labors of recent critical scholarship.

The fame of Erasmus rests upon his work as the chief interpreter to the peoples of northern Europe of the great intellectual movement of the fifteenth century. The circumstances of his uneventful life are of interest only as they illustrate this great service. He was, on his own statement, an illegitimate child, but was tenderly cared for by his parents until their death, when he was about 14 years old. They gave him the best attainable education at the famous school of Deventer and left him a little property—sufficient, he says, if it had been husbanded, to pay his way at a university. His guardians, however, took the more natural and safe course of placing him first at a school of the Brothers of the Common Life at Bois-le-Duc, where he spent, "or rather wasted," about three years, and then in the Augustinian monastery of Canons Regular at Steyn, near Gouda. Here he spent 10 years. He took priest's orders in 1492, but left the monastery, never to return, in 1492 or 1493. For a short time, in 1495 or 1496, he was at Paris. Then he began his career as an independent scholar, living by his pen and the favors it brought him, and continued this life till his death. With frequent intervals of wandering, he resided at Paris, Louvain, in England, at Basel, and Freiburg im Breisgau; for three years he was in Italy (1506–09). His chief attachments were in England and Basel. He was on terms of a certain intimacy with John Colet, founder of St. Paul's School; Thomas Linacre, founder of the London College of Physicians; William Grocyn, teacher of Greek at Oxford; and Thomas More, the great Chancellor. For a time he held a readership in Greek at Cambridge. His serious purpose to devote himself to the revival of "Theology, the Queen of Sciences," dates from his first acquaintance with these men in the last years of the century. Archbishop Warham, of Canterbury, gave him a substantial and permanent income. In Basel he was the intimate of a circle of reforming scholars who gathered about the famous publisher John Froben. In Italy he was for a time a member of the "familia" of the Venetian publisher Aldus Manutius. His correspondence, including more than 1500 letters, shows him in relations with over 500 persons, many of them of the highest station.

Down to the year 1517, when the Lutheran revolt began, the work of Erasmus was largely in criticism of the existing Roman Catholic church system and of the scholastic method in philosophy by which it was defended. In his *Enchiridion Militis Christiani* (The Manual or Dagger of the Christian Soldier, 1523) he lays down in didactic form the uselessness of forms in religion, as compared to the spirit of sincere apostolic piety. In his *Adagia* (1508), a collection of passages from classic authors, he adds to purely philological interpretation a running commentary of moral reflection which gave to this work an immediate and permanent success. In the *Colloquia* (1524), a series of dialogues on a variety of topics, there runs all through the same vein of serious comment on the vices and follies of priests, monks, philosophers, miracle and relic mongers, and all the other formal shams of the time. Even in the *Encomium Moriæ* (The Praise of Folly, 1509), perhaps the most biting, as it was doubtless the most popular, of his satirical writings, a fair examination detects throughout a serious undertone of protest. Still more important was Erasmus' great contribution to critical scholarship in his edition of the Greek New Testament, with a Latin translation, in 1516. Though not the first to conceive the plan of such an undertaking, Erasmus was first in the field, and might well reply to criticism of certain defects, that while others were carping he had done the work, and was quite content if only his service might point the way to other scholars.

With 1517 begins a distinctly new period in Erasmus' life. The Reformation, under Luther's vehement leadership, seemed at first to be only the practical application of ideas which he had always proclaimed. Hitherto he had been the critic, admired and dreaded; henceforth he was to be rather an apologist, not really trusted by either side, yet throwing his weight, unwillingly, now into one, now into the other scale. Personally he always refused to take sides. He remained a Catholic and always so declared himself, though he associated much with the Reformers, among whom he counted many of his friends. He continued his assaults on the evils and errors of the clerical powers, as in the *Colloquia*, but to be called a Lutheran drove him to fury. In the course of the Lutheran controversy Erasmus was drawn out especially by Ulrich von Hutten, once his most ardent admirer and follower, but now so disappointed and irritated by his hesitancy that he could not restrain himself. In his *Expostulatio* he charged Erasmus openly with concealing his real opinions for fear of consequences, and Erasmus replied in his *Spongia Adversus Aspergines Hutteni* (1523), declaring his respect for the Holy See, while at the same time he admits that he had opposed many of its extravagances. Urged on both sides to write something that would be decisive as to his theological position, he replied with the treatise *De Libero Arbitrio* (1524). In this he inveighs against Luther, who replied with the polemical treatise *De Servo Arbitrio contra Servum Des. Erasmum.* Stung by Luther's invective, Erasmus answered in his *Hyperaspistes Diatribe contra Servum Arbitrium Lutheri*, in which he complains of the violence and bitterness of Luther's attack in a manner no less violent and bitter.

Erasmus is often thought of as chiefly a precursor of the Reformation. And yet, in the sense in which the term is used of men like Luther and Calvin, he never was a reformer at all. Upon ignorance and superstition he waged unrelenting war; but it was in the spirit of the humanist, not of the theologian, and the witty mockery of a Lucian was far more to his taste than the religious fervor of a St. Augustine. He was the incarnation of cool, critical common sense, with an unshaken faith in the necessity and efficacy, alike in the secular and ecclesiastical sphere, of liberal studies and freedom of thought. It seemed to him inevitable that increase of knowledge would of itself bring about a peaceful reform of abuses in the church. He had, too, the scholar's dislike of extreme views, which made it difficult for him to side definitely with either party, and the scholar's conservatism, which, with all its openness to new ideas, is yet loath to give up forms consecrated by the life of the past, if in any way new vigor can be breathed into them. In fact, he never really understood the forces that were at work in the religious struggle; and in his letters, speaking of his own participation in it, deplores the metamorphosis of the worshiper of the Muses into a gladiator. But in the fields of Humanism he was easily the foremost man of his age. The range of his reading in the classics, both Latin and Greek, was extraordinarily wide, and he was scarcely less familiar with the most prominent of the Latin and Greek fathers. He loved travel, and, being by nature a keen and thoughtful observer, of social temper and vivacious conversation, had acquired a varied knowledge of men and manners in the frequent changes of residence, made for the sake of more favorable opportunities of work and study. A mind so well stored and possessed of so gay and nimble a fancy might be expected to show remarkable powers of productivity, and in fact Erasmus did compose some of his happiest and most characteristic things in an exceedingly short space of time. The *Encomium Moriæ*, e.g., was sketched during his journey from Italy, and written out from his notes in seven days during his stay in Sir Thomas More's house in London. Still, splendid as was his equipment, the amount and range of his intellectual activity are little short of the marvelous. For he was by no means a genius, and his scholarly labors were accomplished only by unremitting industry. No one did more than he to restore ancient letters. He published editions of the works of Aristotle and Demosthenes, and translations of several of the plays of Euripides, of the greater part of Lucian, and of the *Moralia* of Plutarch. He edited, either in whole or in part, among other Latin authors, Terence, Cicero, and Livy, and, in addition, a long series of patristic writers. In 1505, in the preface to an edition of Lorenzo Valla's *Annotations to the New Testament*, he maintained that a correct translation of the Bible could be made only by a trained philologist, and that there was need of a critical revision of the original Greek text and of a new translation. Subsequently he decided to undertake this work himself; and in a letter to Colet, dated May, 1512, he says that he has already collated the New Testament with the ancient Greek manuscripts and annotated it in more than 1000 places. At the same time he was actively engaged upon a new edition, in nine folio volumes, of St. Jerome. Froben, whose press at Basel became for a while, through the editorial coöperation of Erasmus, the most important in Europe, has left us a vivid account of his incessant work, study, and writing, in and about the printing house, when these two works were approaching completion. "In the midst of all, visitors of rank would make no scruple of calling on him and interrupting him about some trifle or other; one would try to wheedle him out of an epigram, another to gain immortality by a letter. And how did he, the most easy, good-natured man in the world, act on these occasions? Did he refuse? Did he manifest impatience? He was fully occupied in writing—break off his employments he could not. Yet write he did, at odd moments, as he went to and from mass, anything to oblige." The medium of all his work was Latin. He refused the position of public reader at Louvain because of his imperfect mastery of Dutch, though it was his native tongue. Of French he had some slight command, of English and Italian none. But Latin was still the colloquial language of scholars and the regular medium of formal communication. In the hands of Erasmus it has all the vitality of a living language, though far from classical in its standards, with a vocabulary drawn from many different sources, and a style wholly modern and individual, the charm of which is the expression of the man's own character.

The best guide to the writings of Erasmus is the *Bibliotheca Erasmiana*, edited by the University Library of Ghent (1893). Under the same editorship a still more complete *Bibliotheca Erasmiana*, in 16mo form, has been appearing in parts since 1897. There are editions of the complete works by Beatus Rhenanus (9 vols., Basel, 1540) and J. Le Clerc (10 vols., fol., Amsterdam, 1703–06). Erasmus himself collected many of his letters for publication, and in the years following his death several incomplete editions appeared. The more important later editions are those of Merula (Leyden, 1607), the "London Edition" of 1642 (in 2 vols., fol.), and vol. iii of Le Clerc. Consult the text of his letters (Oxford, vol. i, 1906; vol. 2, 1910). *Epistles from his Earliest Letters to his 51st Year* have been published in an English translation by F. M. Nichols (2 vols., London, 1901–04). Attempts to fix the very uncertain chronology of Erasmus' life have been made by Richter, *Erasmus-Studien* (Dresden, 1891); Reich, *Untersuchungen, etc.* (Trèves, 1896); and Nichols, as above. For the life of Erasmus, consult: Knight (Cambridge, 1726); Durand de Laur (Paris, 1872); Drummond (London, 1873); Froude, *Lectures* (ib., 1894) and *Life and Letters* (New York, 1912); Emerton (New York, 1899); Pennington (London, 1901); Capey (ib., 1902); Allen, *Age of Erasmus* (Oxford, 1914).

ERAS'MUS, SAINT. A Syrian bishop of the third century, who is said to have suffered martyrdom at Formiæ (ancient form of Mola di Gaëta) in Campania, during the reign of Diocletian. In 842, when the Saracens took this city, his body was transferred to Cajeta. June 2 is dedicated to him by the Roman Catholic church.

ERAS'TIANS. Properly, the adherents of the doctrines laid down by Erastus (q.v.) in his book on excommunication. As commonly used, however, particularly in England, the term is applied to those who would entirely subordinate church government to the authority of the state, or maintain the authority of the civil magistrate over the conscience, and subject all ecclesiastical bodies to his control, both in doctrine and discipline. In the Westminster Assembly (1643–49) views similar to those of Erastus were advocated by the lawyers Selden, Saint-John, and Whitelocke, and the clergymen Lightfoot and Coleman. During the conflict in the Church of Scotland which resulted in the secession of the Free church (1833–34) the term "Erastian" was applied as a reproach to all who held that the church had no power to nullify by law the operation of lay patronage, but was indignantly rejected by them. Consult Cunningham, *Historical Theology*, vol. ii (Edinburgh, 1862), and Henson, *English Religion in the Seventeenth Century* (London, 1903).

ERAS'TUS (Lat., from Gk. *ἐραστός*, lovely; a translation of his German name, Lieber or Liebler), THOMAS (1524–83). A Swiss physician and theologian. He was born in the Canton of Aargau, Sept. 7, 1524. He studied theology at Basel (1540–44) and adopted the doctrines of Zwingli. In 1544 he went to Italy and studied medicine at Padua and Bologna. After nine years he returned to his own country and became physician to the Count of Henneberg. He acquired a great reputation as a physician. In 1558 he went, by invitation, to the court of the Elector Palatine and became first physician and Privy Councilor and professor of medicine at the University of Heidelberg. In 1580 he accepted a similar appointment at Basel and in 1583 undertook also the professorship of ethics. He died at Basel, Dec. 31, 1583. Before his death he established a foundation for the education of poor students in medicine, which was long known as the Erastian Foundation. As a physician Erastus opposed the astrology and magic of Paracelsus and his school and held that experimental investigation is the true road to knowledge. He approved of prosecutions for witchcraft. A collected edition of his medical works appeared at Zurich in 1595. He is now remembered, however, chiefly for his theological writings. In 1564 he had taken part in the conference at Maulbronn between theologians from the Palatinate and Wittenberg and had contended for the Zwinglian doctrine of the Lord's Supper. In defense of this view he published his *Vom Verstand der Wort Christi, "Das ist mein Leib,"* in 1565. His great work is the *Explicatio Gravissimæ Questionis utrum Excommunicatio Mandato Nitatur Divino an Excogitata Sit ab Hominibus.* In this book Erastus maintains that, while the church may decide who are its members, it should do so upon doctrinal grounds alone, and not exclude for vice or immorality; and that in no case should the church, inflict punishment, to do which properly belongs to the civil magistrate alone. He denies the right of excommunication altogether and compares a pastor to a professor of any science, who can merely instruct his students. The theory known in England as Erastian is not directly expressed in this book. The work was written in 1568, but not published until six years after Erastus' death. He had expressed similar views, however, during his lifetime in a controversy at Heidelberg with certain refugees from the Netherlands, and particularly one Caspar Olevianus, of Treves, who were zealous for censures and excommunications and stirred up in the Palatinate what Erastus called a *febris excommunicatoria.* He was opposed at that time by Dathenus and Beza. Consult Lee, *The Theses of Erastus Touching Excommunication* (Edinburgh, 1844), and Bonnard, *Thomas Eraste et la discipline ecclésiastique* (Lausanne, 1894).

ER'ATO (Lat., from Gk. Ἐρατώ). One of the nine Muses, daughters of Zeus and Mnemosyne. She presided over amatory and nuptial poetry. See MUSES.

ER'ATOS'THENES (Lat., from Gk. Ἐρατοσθένης) (c.275–195 B.C.). An eminent Greek astronomer and geometer. Eratosthenes was born at Cyrene; for a time he enjoyed the teaching of Lysanias and Callimachus and then went to Athens, where he heard the Stoic Ariston of Chios and the Academic Arcesilaus. Ptolemy III Euergetes recalled him to Alexandria and about 240 B.C. installed him as Callimachus' successor in the office of librarian. At the age of

80 or upward, having become totally blind, he died of voluntary starvation. Eratosthenes' interests covered an enormous range. He wrote a commentary to Plato's *Timæus* and also composed popular philosophical dialogues; in literary history he produced a great work, *On the Old Comedy*, in at least 12 books. This dealt with the theatre on its physical side and treated the works of the chief comic poets, discussing the authorship and date of plays, matters of text, language, and subject matter. His chronological researches also were important; he tried to fix the dates of the main events, in literature as in politics, from the time of the fall of Troy. In the field of pure mathematics he wrote on the doubling of the sphere and on a method of distinguishing prime and composite numbers. His astronomical views he set forth in part in the poems *Hermes*, *Erigone*, and probably *Anterinys*. The extant work *Katasterismoi* (*Καταστερισμοί*), in which an account is given of the constellations in their relations to the popular mythology, is only a summary of a work by Eratosthenes which was apparently entitled *The Catalogues*, and in its present form has been worked over to follow the order of the *Phænomena* of Aratus.

It was, however, by his attempt to measure the size of the earth and by his geographical studies that Eratosthenes won most renown. He endeavored to determine the obliquity of the ecliptic by measuring the distance between the tropics; this he found to be 47° 42′ 39″, which gave 23° 51′ 19.5″ for the obliquity of the ecliptic. Considering the means of observation available and the state of knowledge at the time, the degree of error in his result—a trifle more than 23′—is remarkably small. To measure the circumference of the earth he adopted the means employed at the present day. He found that the distance between Syene and Alexandria was one-fiftieth of a great circle, about 7° 13′, and on this basis computed the circumference of the earth to be 250,000 stadia; but, since we do not know the length of the stadium Eratosthenes used as his unit, we cannot determine the degree of error in his result. His greatest scientific publication was probably his Geography (Γεωγραφικά), in three books, the first scientific treatise on the subject; it gave the history of the science and embodied the results of his own investigations. He knew, e.g., that the earth was round. In his researches Eratosthenes was greatly assisted by his patron, Ptolemy Euergetes, and he had the resources of the Alexandrian Library at his command. He was undoubtedly first among the Alexandrians for great and wide learning, although in the special fields of poetry and philosophy others surpassed him. The extant fragments of his writings are collected and discussed in the following works: Bernhardy, *Eratosthenica* (Berlin, 1822); Stiehle, "Zu den Fragmenten des Eratosthenes," in *Philologus*, supplementary vol. ii (Göttingen, 1863); Berger, *Die geographischen Fragmente des Eratosthenes* (Leipzig, 1880); Hiller, *Eratosthenis Carminum Reliquiæ* (ib., 1872); Maass, "Eratosthenica," in *Philologische Untersuchungen*, vol. vi, ed. by Kiessling and Wilamowitz-Möllendorff (Berlin, 1883); Robert, *Eratosthenis Catasterismorum Reliquiæ* (ib., 1878); Olivieri, "Pseudo-Eratosthenis Catasterismi," in *Mythographi Græci*, iii (Leipzig, 1897); Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit*, vol. i (ib., 1892); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii (5th ed., Munich, 1911). See ASTRONOMY; CHRONOLOGY; GEOGRAPHY, *History of Geography*.

ERB, ĕrp, WILHELM HEINRICH (1840–). A German neuropathologist. He was born at Winnweiler, Bavaria, and was educated at Heidelberg, Erlangen, and Munich. After occupying the chair of special pathology and therapy at Leipzig, from 1880 to 1883, he was appointed to the same department at Heidelberg, where he also was made clinical director. He was well known as a specialist on electrotherapy and neuropathology. He published the following works: *Handbuch der Krankheiten der peripheren cerebro-spinalen Nerven* (2d ed., 1876); *Handbuch der Krankheiten des Rückenmarks und des verlängerten Marks* (2d ed., 1878); *Handbuch der Elektrotherapie* (2d ed., 1886; Eng. trans. by L. Putzel, 1883); *Ueber die neuere Entwicklung der Nervenpathologie* 1880); *Dystrophia Muscularis Progressiva* (1891); *Gesammelte Abhandlungen* (1910).

ER'BEN, HENRY (1832–1909). An American naval officer, born in New York City. He graduated at the United States Naval Academy in 1854, was employed in deep-sea sounding in the Atlantic in 1855, and in 1856–59 served in the China station as a lieutenant on board the frigate *Mississippi*. During the Civil War he was with Farragut in the Gulf squadron, with Foote on the Mississippi River, and with Dupont in the attack on Charleston, and the blockade of the Mexican coast. He was commander of the New York Navy Yard in 1891–92 and of the European squadron in 1893–94. In 1894 he attained the rank of rear admiral and in the same year was retired from the service, but voluntarily returned to service in the Spanish-American War.

ERBEN, ĕr'ben, KARL JAROMÍR (1811–70). A Czech scholar and poet. He was born at Miletin and was educated at Prague. He took a prominent part in the Czech movement of 1848, in 1850 became secretary of the Prague Museum, and town archivist in the following year. His chief historical publication is entitled *Regesta Diplomatica nec non Epistolaria Bohemiæ et Moraviæ* (1855). It was continued by Emler (1882–92). He was a gifted lyric poet, among his original verses being the collection of ballads entitled *Kytice* (A Bouquet; latest ed., 1890). His collection of Czech folk songs (3 vols., 1842–45, subsequently enlarged) was followed by another of popular melodies (1844–47 and 1860) and the publication of 100 Slavic folk tales (1863–65), which brought him a reputation comparable to that of the brothers Grimm. He also compiled a judicial terminology in Czech and published editions of several Czech authors, including the vernacular works of John Huss. Consult Novák, *Cechische Litteratur der Gegenwart* (Leipzig, 1907).

ER'BIUM (Neo-Lat., from *Ytterby* in Sweden). A metallic element discovered by Mosander in 1843. It is one of the constituents of the mineral gadolinite, which is found in Ytterby, Sweden. Erbium (symbol Er, atomic weight 167.7) is similar to the elements yttrium and ytterbium, with which it is found, and forms a series of rose-colored salts that give an acid reaction with litmus, but have a sweet astringent taste. Among the inorganic salts of erbium may be mentioned the *sulphate*, $Er_2(SO_4)_3 + 8H_2O$; the *nitrate*, $Er(NO_3)_3 + 5H_2O$; and the very soluble *double sulphates* of erbium with potassium, $Er_2(SO_4)_3 . K_2SO_4 + 4H_2O$, and with ammonium, $Er_2(SO_4)_3 . (NH_4)_2SO_4 + 4H_2O$. The *oxide* of erbium, Er_2O_3, is obtained in the form of a pink powder.

ERBT, ĕrpt, WILHELM (1876–). A German biblical scholar, born in Berlin and educated at the universities of Halle, Greifswald, and Leipzig, and at the preachers' seminary in Wittenberg. He taught in several girls' schools and held pastorates, but is better known for his excellent works on Hebrew religion and related subjects. He wrote: *Die Purimsage in der Bibel* (1900); *Jeremia und seine Zeit* (1902); *Sicherstellung des Monotheismus* (1903); *Israel und Juda* (1903); *Die Urgeschichte der Bibel* (1904); *Die Hebräer* (1906); *Elia, Elisa, Jona* (1907); *Handbuch zum Aten Testament* (1909); *Kirchengeschichte* (5th ed., 1913); *Das Markusevangelium* (1911); *Von Jerusalem nach Rom* (1912); *Geschichte der Religion in der Alten Welt* (1913).

ER′CELDOUNE, THOMAS OF. See THOMAS THE RHYMER.

ERCILLA Y ZÚÑIGA, är-thē′lyä ē thōō′-nyē-gä, ALONSO DE (1533–94). A Spanish epic poet, who enjoys the distinction of having written the first work of literary merit known to have been composed upon either American continent. He was born in Madrid, became page to Philip II, and accompanied the latter to England on the occasion of his nuptials with Queen Mary. Thence Ercilla sailed for America with the army dispatched to quell the insurrection of the Araucanians in Chile. Here the brave resistance of the natives in the unequal struggle inspired Ercilla with the idea of using the subject for an epic poem. An unfounded suspicion of his having plotted an insurrection ruined his career, and he was tried, condemned, and had actually ascended the scaffold, when his sentence was commuted to exile at Callao. He returned to Europe in 1562, and, after giving to Philip an account of his services, he set out for Austria to find his sister, who was *dame d'honneur* to the Empress, and whose hand was being sought in marriage. He wandered through France, Italy, Germany, Bohemia, and Hungary, and returned in 1564 via Switzerland and the Languedoc. In 1571 the King gave him the habit of the Order of Santiago, and he was dubbed Knight on November 30, the anniversary of the bloody battle of Millarapué, which his valor had been largely instrumental in winning. For a while he held the office of chamberlain to the Emperor Rudolph II, but in 1577 he returned to Madrid, where, after a period of royal favor lasting until 1588, he fell into disfavor and died in poverty and obscurity. The first 15 cantos of his epic, *La Araucana*, written in the *ottava rima*, appeared in 1569; the continuations, 37 cantos in all, were published in 1578 and 1589. In 1590 appeared a new edition augmented by two cantos. A convenient edition is in the *Biblioteca de autores españoles*, vol. xvii. A continuation, of little value, was written by Diego de Santisteban y Osorio (Salamanca, 1597). Consult A. Royer, *Etude littéraire sur l'Araucana d'Ercilla* (Dijon, 1879), and A. Bello, *Obras completas* (vol. vi, Santiago de Chile, 1883). Consult also the facsimile of the princeps edition (parts i, ii), made by Archer M. Huntington (New York, 1902–03).

ERCKMANN-CHATRIAN, ĕrk′män-shä′-trē′äN′. The name employed to indicate the joint authorship of EMILE ERCKMANN (1822–99) and ALEXANDRE CHATRIAN (1826–90), whose combined work affords one of the most remarkable instances of modern collaboration. Erckmann was born in Pfalzburg (in Lorraine), Chatrian at Soldatenthal (in the same district). Both were, therefore, of that border territory annexed to Germany in 1871, in which is laid the scene of most of their works. Erckmann had successfully studied law in Paris, and Chatrian for a time had been an instructor in the college at Pfalzburg, when they began the publication, in the *Démocrate du Rhin*, of a series of feuilletons. The story "L'Illustre docteur Mathéus" (1859), originally published in the *Revue Nouvelle*, was their first success. This they followed up with a long and widely read series, of which the *Histoire d'un conscrit de 1813* (1864; 20th ed., 1869; Eng. trans., 1909) is the best-known volume. *L'Ami Fritz* (1864) and *Waterloo* (15th ed., 1865; Eng. trans., 1905), a sequel to the *Conscrit*, should also be mentioned. As dramatists, Erckmann and Chatrian appeared in two productions of much merit, *Le juif polonais* (1869) and *L'Ami Fritz* (1876), the latter derived from their book of that name. The former is familiar in England and America through its adaptation (1871) by Leopold Lewis as *The Bells*, the Mathias of which was one of the most skillful impersonations in the répertoire of Sir Henry Irving. The stories are marked by humor, clever characterization, and convincing details of local color, and also by their democracy, patriotism, and antimilitarism. The literary partnership was finally dissolved. Erckmann's independent work is of less importance. An edition by Pfau, of German translations of the chief joint works, appeared at Stuttgart in 1882 (9 vols.). Their joint work also includes: *Histoires et contes fantastiques* (1849); *Madame Thérèse* (1863; 13th ed., 1869; Eng. trans., 1010); *Le Blocus* (1867); *Histoire d'un paysan* (4 vols., 1868–70); *L'Histoire du plébiscite* (1872); *Le Grandpère Lebigue* (1880).

ERDÉLYI, ĕr′dāl-yē, JÁNOS (1814–68). An Hungarian poet and folklorist, born at Kapos. He published a number of works fairly well known in his native country, in 1848 was appointed director of the national theatre at Pest, and in 1849 became professor of philosophy at Sárospatak. He is remembered for a collection of the popular songs and legends of Hungary, *Népdalok és mondák* (3 vols., 1846–48), which is an important addition to the folklore of Europe. His collection of Hungarian proverbs (Pest, 1851) is noteworthy, containing over 7000 hitherto unknown examples. Some of his smaller works were translated into German under the titles *Bahnen und Palmen* (1886) and *Studien* (1890).

ERDMANN, ĕrt′män, BENNO (1851–). A German philosopher, born at Guhrau, Prussian Silesia, the son of Johann Eduard Erdmann. He was made professor successively at Kiel (1877), at Breslau (1884), at Halle (1890), at Bonn (1898), and at Berlin (1909). His works, devoted principally to the Kantian philosophy, include the following: *Kants Kritizismus* (1878); *Nachträge zu Kants Kritik der reinen Vernunft* (1881); *Reflexionen Kants zur kritischen Philosophie* (1882–84); *Logik* (1892 ff.); *Psychologische Untersuchungen über das Lesen auf experimentaler Grundlage* (1898);

Immanuel Kant (1904); *Wissenschaftliche Hypothesen über Leib und Seele* (1908).

ERDMANN, David (1821–1905). A German Protestant theologian. He was born at Güstebiese, Province of Brandenburg, and was educated at Berlin, where in 1850 he became assistant preacher in the cathedral. In 1856 he became professor of theology at Königsberg, and in 1864 was appointed Superintendent-General of Silesia at Breslau. His appointment as Superior Consistorial Counselor followed in 1889. He retired in 1900. Erdmann wrote: *Lieben und Leiden der ersten Christen* (1854); *Die Reformation und ihre Märtyrer in Italien* (1855); a commentary on the Epistle of James (1881); *Luther und die Hohenzollern* (2d ed., 1884); "Samuel," in Lange's *Bibelwerk* (1873). Consult Eberlein, *Aus einem reichen Leben: Blätter der Erinnerung an David Erdmann* (Berlin, 1907).

ERDMANN, Johann Eduard (1805–92). A German philosopher, born at Wolmar, Livonia. He studied theology at Dorpat, attended the lectures of Schleiermacher and Hegel at Berlin, and was then pastor in his native town (1829–32). In 1834 he became privatdocent in philosophy at Berlin, and in 1836 he was appointed professor of philosophy at Halle. His many writings on philosophical subjects show his sympathy with Hegel's ideas, and he was one of his prominent disciples. As a teacher and lecturer, he was extremely popular. His most important work is his *Grundriss der Geschichte der Philosophie* (1866; Eng. trans., 1892), which is still in the later editions a most useful book. Among his other numerous works may be mentioned: *Grundriss der Psychologie* (1840; *Grundriss der Logik und Metaphysik* (1841); *Psychologische Briefe* (1851).

ERDMANN, Otto Linné (1804–69). A German chemist, born in Dresden. He studied at the Academy of Medicine and Surgery in Dresden, then devoted himself to chemistry, and, after several years of theoretical study and industrial work, became in 1827 professor of industrial chemistry at the University of Leipzig, from which he had graduated with the degree of Ph.D. in 1824. Among his valuable contributions to chemistry, his atomic-weight determinations, his investigations of the properties of nickel, and his researches on illuminating gas and a number of dyestuffs deserve mention. He wrote: *Grundriss der Warenkunde* (1833; 12th ed., 1895); *Ueber das Studium der Chemie* (1861), which has been translated into several European languages; etc. He was the founder, and for several years editor, of the *Journal für technische und ökonomische Chemie* and later edited the *Journal für praktische Chemie.*

ERDMANNSDÖRFER, ĕrt′mäns-dĕr′fĕr, Max (1848–1905). A German musician. He was born at Nuremberg, and from 1863 to 1869 studied at the conservatories of Leipzig and Dresden. After conducting the court orchestra at Sondershausen from 1871 to 1880, he was in 1882 appointed director of the Imperial Musical Society at Moscow and professor in the Conservatory there. As the founder of the Students' Orchestral Society at the latter institution (1885), he contributed greatly to the development of a genuine musical spirit among its pupils. He was leader of the Philharmonic Society at Bremen from 1889 to 1895. He subsequently became conductor of the Symphony Concerts at St. Petersburg for a short time and was in 1896 appointed leader of the court orchestra at Munich. His works include: *Prinzessin Ilse* (1870); *Schneewittchen* (1873); *Traumkönig und sein Lieb,* forest legends for soli, chorus, and orchestra.

ERDMANNSDÖRFFER, Bernhard (1833–1901). A German historian. He was born at Altenburg and, after studying at Jena and Berlin, went to Italy for the purpose of carrying on philological and historical investigations. He was appointed assistant professor of history at the University of Berlin in 1869 and subsequently held full professorships at Greifswald, Breslau, and Heidelberg, where he succeeded Treitschke. Among his principal works may be mentioned: *De Commercio quod inter Venetos et Germaniæ Civitates Ævo Medio Intercessit* (1858); *Deutsche Geschichte vom westfälischen Frieden bis zum Regierungsantritt Friedrichs des Grossen* (1888 et seq.). He edited the "Politischen Verhandlungen" (5 vols., 1864–83), in the *Urkunden und Aktenstücke zur Geschichte des Kurfürsten Friedrich Wilhelm von Brandenburg.*

ER′EBUS (Lat., from Gk. *ἔρεβος, erebos,* darkness). A term used by the ancient Greeks and Romans specially to denote the darkness of the lower world, and hence employed to denote the lower world itself. From Erebus Hercules brought Cerberus; to it the souls of the departed went. In the mythographers Erebus is called a son of Chaos, and father of Æther and Hemera (Day).

EREBUS AND TERROR. Two volcanoes in South Victoria Land (q.v.). Mount Erebus is 12,370 feet high, and was active when the two were discovered by Sir J. C. Ross in 1841. A party from Shackleton's expedition ascended the volcano during March, 1908, and found proofs sufficient to show that Erebus possesses still considerable volcanic activity. Mount Terror, situated about 30 miles farther east and nearer the coast, is about 10,900 feet high and is probably extinct. The volcanoes received their names from the two vessels used by Ross in his expedition.

E′REC AND E′NID. A metrical romance by Chrestien de Troyes, recounting the fortunes of an Arthurian knight who marries the niece of a vanquished enemy, sinks into the slothful enjoyment of the pleasures of love, is quickened to renewed action by the reproaches of his vassals, and, with his wife, goes forth to seek knightly adventures.

ERECH, ē′rĕk (Assyrian *Uruk,* Gk. Ὀρχογ, *Orchog,* Heb. *Erek*). A city in ancient Babylonia. Its site is at the modern village of Warka, where large mounds and numerous ruins testify to its extent in former times. Excavations on the spot have furnished a few documents from the time of Gudea of Lagash, and Ur Engur and Dungi of Ur; of Singashid, when Erech was the capital of the State of Amnana; and of Mardukapaliddin (721–710 B.C.). The German excavations in 1913 threw light upon the Seleucid and Arsacid periods, but less attention seems to have been paid to the lower strata. The city is frequently referred to in Assyrian and Babylonian literature. Its foundation is ascribed to Marduk, but its most famous shrine was the Temple of Nana. This goddess was carried into Elamitish captivity for 1635 years but brought back by Asurbanipal c.640 B.C. Erech is the scene of many important myths. Recent discoveries showed that there were at least two important dynasties reigning there. (See BABYLONIA.) Its situation rendered it comparatively secure against invasions, and its commercial prosperity is indicated in many contract tablets. It seems to have flourished into the Parthian period. Consult Loftus, *Travels and Researches in Chaldea and Susiana, with an Account of Excavations at Warka* (London, 1857), and Ed. Meyer, *Geschichte des Altertums* (3d ed., Berlin, 1913).

ER'ECHTHE'UM (Lat., from Gk. 'Ερέχθειον, *Erechtheion*, (temple) belonging to Erechtheus). A temple on the Acropolis of Athens, northwest of the Parthenon, in which were combined the sanctuaries of Athena Polias and Erechtheus (q.v.). It also contained several other wonders, such as the "salt sea" of Poseidon and the mark of his trident, made by Poseidon when he created the horse in his contest with Athena for the possession of Attica, while near by was the sacred olive of Athena, and apparently the tomb of Cecrops. To make surer the preservation of these sacred tokens, the building, though of great beauty, departs widely from the ordinary type of Greek temple. It consists of a quadrangular main building, 74 feet by 37, with porticoes on three sides. The level of the east and south sides is about 9 feet higher than that of the west and north sides. At the east the portico extends across the entire front of the temple, and its roof is supported by six Ionic columns. The north and south porticos are at the west end of the building. That on the south is the Porch of the Maidens, so called from the six female statues, somewhat larger than life, which support the roof. (See CARYATIDES.) The north porch is on a lower level than the east or south and also contains Ionic columns, arranged like the statues, four in front and one on each side. There seem to have been no pediment sculptures, but above the architrave was a frieze of dark marble, decorated with reliefs of white marble. Of these figures only fragments have been preserved. The west front had a gable supported by four columns, resting on a somewhat high wall, in which is a low door. During the Roman period these columns were replaced by engaged columns between which were windows. The interior arrangements are still a matter of much dispute, due partly to the differences in level, and partly to alterations made when the building was transformed into a Byzantine church. It seems clear that the shrine of Athena Polias, with the sacred wooden image, was in the east end, and the Erechtheum proper in the west. The building was begun, probably, about 421 B.C. (some say 437 B.C.); inscriptions show that it was nearly complete in 409 B.C. It seems to have suffered from fire in 406 B.C., and was probably still unfinished in 395 B.C. The Greeks have lately restored the building, as far as was possible, from the pieces lying around; for a photograph of the restored structure, consult the work by Bates cited below, page 318. From a careful study recently devoted to the temple it has been demonstrated that the eastern part of the cella was lighted by two windows, one on each side of the door. Consult Fowler, *Papers of the American School at Athens*, vol. i (Boston, 1885), for a description of the building in 1883, with bibliography; also Baumeister, *Denkmäler des klassischen Altertums*, s.v. *Erechtheion* (Munich, 1885); Frazer, *Pausanius*, vol. ii (2d ed., London, 1913); Stevens, *American Journal of Archæology*, vol. x (1906); Harrison and Verrall, *Mythology and Monuments of Ancient Athens* (London, 1890); E. A. Gardner, *Ancient Athens* (New York, 1902); D'Ooge, *The Acropolis of Athens* (ib., 1908); Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909); Weller, *Athens and its Monuments* (New York, 1913). For an original treatment of the Erechtheum, consult Elderkin, *Problems in Periclean Buildings* (Princeton, 1912).

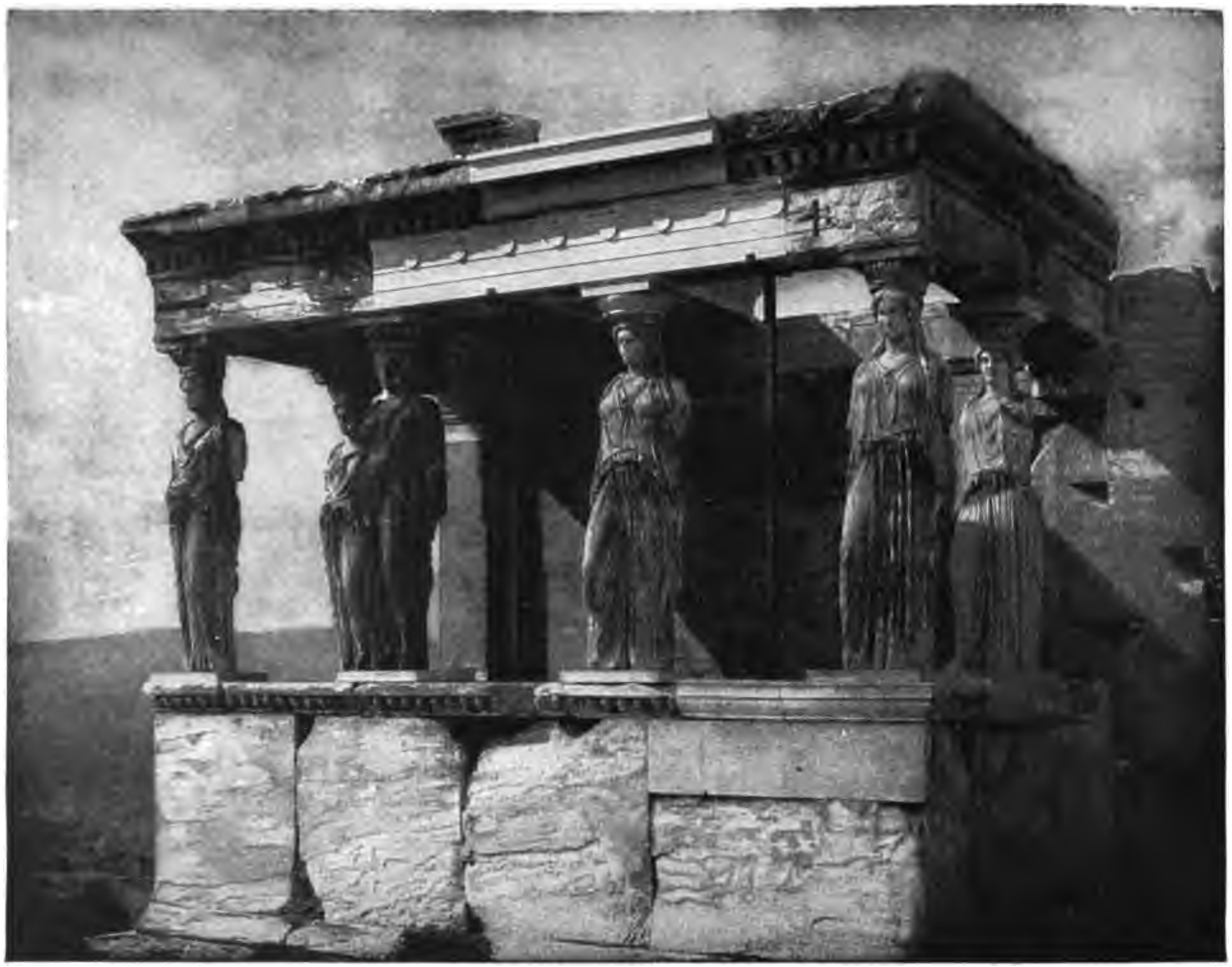
ERECH'THEUS, or **ER'ICHTHO'NIUS** (Lat., from Gk. 'Ερέχθευς, 'Εριχθόνιος, *Erichthonios*). A character in Greek mythology. Erechtheus is called, in the *Iliad*, son of the earth and was reared by Athena in her temple on the Acropolis, where the Athenians worshiped him. Later writers told a similar story of Erichthonius. He was son of Hephæstus and Gæa (the earth), and was placed by Athena in a chest with a serpent (perhaps rather the child was in whole or in part in the form of a serpent). The daughters of Cecrops, to whom the chest was given, disobeyed the command of the goddess and raised the lid, when they were either destroyed by the serpent or in sudden madness at sight of it threw themselves from the rocks of the Acropolis. This form of the legend made Erechtheus son or grandson of Erichthonius and told of his sacrifice of his daughter to save Athens from the attack of Eumolpus (q.v.). It is to be noted that while the later poets and mythologists distinguish Erichthonius and Erechtheus, the early epic and the cult know only the latter, who is clearly an Athenian god of agriculture, who was worshiped with the goddess Athena in a joint temple, called the Erechtheum (q.v.), on the Acropolis. Later legend reduced him to a hero and connected him with Poseidon, or told of him as the promoter of the worship of Athena. Powell, "Erichthonius and the Three Daughters of Cecrops," in *Cornell Studies in Classical Philology* (1906), regarded Erechtheus, Erichthonius, Poseidon, and Cecrops as all alike representatives of the sacred serpent of Athena; with the cult represented by them Athena at first had to struggle, but later she conquered it and fused it with her own. Consult also Farnell, *Cults of the Greek States*, vol. i (Oxford, 1896), and Frazer, *Pausanias*, vol. ii (2d ed., London, 1913).

EREGLI, ā-rā'glē (ancient *Heracleia Pontica*). A seaport town of Asiatic Turkey, in the Vilayet of Kastamuni, situated on the Black Sea about 128 miles east of Constantinople (Map: Turkey in Asia, B 2). Its harbor, which is known by the name of Zoungundalk, is the outlet for the coal mined in the neighborhood. The coal fields of this region are the only ones developed in Turkey. About 750,000 tons are extracted annually. The mines are owned chiefly by French capitalists. The population is estimated at about 6300.

EREMITA, JOHANNES. See CASSIANUS.

EREMIT VON GAUTING, ā're-mēt' fōn gou'tĭng. See HALLBERG-BROICH, THEODOR M. H.

ERE'TRIA (Lat., from Gk. 'Ερέτρια). A city on the west coast of Eubœa, south of Chalcis, of which it was in early times a powerful rival. It helped the Asiatic Greeks of Ionia in their revolt against the Persians (498 B.C.); hence it was destroyed by the Persians in 490. It was, however, soon rebuilt, though it was not prom-



THE ERECHTHEUM
PORCH OF THE CARYATIDES

inent in later history, except for a short time during the struggle between Athens and Philip of Macedon. It was the seat of the school of philosophy established by Menedemus, a disciple of Plato. The American School at Athens conducted excavations on this site (1890–95), resulting in the discovery of the theatre and some neighboring buildings, and further investigations are being carried on by the Greek Archæological Society, which have brought to light an early temple and many lesser remains of the pre-Persian time. The site is occupied by a village called Nea Parsa. Consult *Papers of the American School at Athens*, vol. vi. See Greece, *History, Ancient History.*

ERFORDIA. See Erfurt.

ERFURT, ĕr'fụrt (OHG. *Erpisford, Erpesfurt,* Lat. *Erfordia,* ford of Erpe, its legendary founder). A town of the Prussian Province of Saxony, 14 miles west of Weimar (Map: Prussia, D 3). It is the capital of the government district of Erfurt (area, 1364 square miles; pop., 1910, 530,775. Erfurt is situated on the Gera, which traverses the town in three arms. An important fortress until 1873, Erfurt retains only portions of the citadels of Petersberg and Cyriaxburg. The town, which has an ancient aspect, is irregularly built, and many of its streets are narrow and bordered with old-fashioned houses. The most noteworthy church of Erfurt is the cathedral (*Beatæ Mariæ Virginis*), occupying the site of an old edifice dating from the twelfth century and constructed mainly during the thirteenth, fourteenth, and fifteenth centuries. It is one of the finest churches in Germany. Its foundation is of enormous proportions, and its interior is ornamented with fine reliefs, paintings, stained glass, and carved choir stalls. The nave was rebuilt in the thirteenth century in the Gothic style. The chancel dates from 1349 to 1372. The twin towers date from the thirteenth century and contain 10 bells, including the Maria Gloriosa, which bears the date 1497 and weighs over 13 tons. Adjoining the cathedral is the great fourteenth-century church of St. Severus, with three pointed towers, altar reliefs, and statues. The cathedral and St. Severus occupy an eminence known as the Domberg and form an impressive mass, approached by a flight of 48 stone steps. The two churches are Roman Catholic. There are several other mediæval churches, now Evangelical; among them are the Reglerkirche, in Romanesque style, which has a twelfth-century tower and was restored in 1859; the twelfth-century Predigerkirche; and the Gothic Barfüsserkirche, which has interesting fourteenth-century monuments. Of the numerous monasteries of Erfurt only two have survived, of which that of St. Augustine, famous as the residence of Luther, now serves as an orphanage, while the other is used as a school for girls. Among the secular buildings the most prominent are the Rathaus, erected in 1869–75 and adorned with frescoes; the courthouse, the central railway station, and the government buildings occupied in 1808 by Napoleon during his famous sojourn here.

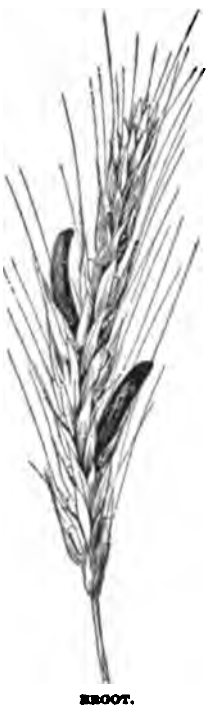
The city is administered by a chief burgomaster, a burgomaster, a board of magistrates of 15 members, and a municipal council of 48 members. It owns its water works, a pawnshop, and an abattoir. The street railways are run by electricity. There was formerly a university, established in 1378, but discontinued in 1816. The most prominent educational institutions now are the gymnasium originally founded in 1561, a real gymnasium, a realschule, a teachers' seminary, and several art and technical schools. There should also be mentioned the royal library, with over 60,000 volumes and 7700 manuscripts, the municipal theatre, and the museum of Thuringian antiquities and costumes. The chief industries of Erfurt are the manufacture of ladies' cloaks, shoes, iron products, woolen, cotton, and linen goods, machines, arms, and cigars. Another important industry is the culture of flowers and vegetables, of which Erfurt exports large quantities. The commerce is of some magnitude, and there are several important financial institutions. Pop., 1875, 48,025; 1890, 72,360; 1900, 85,202; 1910, 111,463, of whom about seven-eighths are Protestants. The commune has an area of about 17 square miles.

Erfurt traces its origin to a mythical founder, Erpe, of the sixth century. St. Boniface established a bishopric at Erfurt in 741, but it reverted to Mainz in 755. Charlemagne made it a staple town in 805. Though ruled by governors appointed by the archbishops of Mainz, who claimed sovereignty because of royal charter rights, Erfurt possessed extensive municipal rights till 1664, and in the fifteenth century, when it belonged to the Hanseatic League, was exceedingly prosperous, enjoying freedom of trade throughout the Empire and ruling over a considerable district, acquired either by force or purchase. From 1483 to 1648 Erfurt belonged to Saxony. After Westphalia it was given back to Mainz and remained in her possession until 1802. In 1802 it came to Prussia and in 1806 passed to France. At Erfurt, in 1808, Napoleon played the conqueror for several months, there being present Alexander of Russia and a host of German princes. In 1814 the town was recovered by Prussia. In 1850 Erfurt was the seat of the Union Parliament. (See Germany.) In 1902 the hundredth anniversary of Erfurt's incorporation with Prussia was celebrated. Consult: Tettau, *Erfurt in seiner Vergangenheit und Gegenwart* (Erfurt, 1880); Röll, "Erfurt," in *Europäische Wanderbilder* (Zurich, 1888); Beyer, *Geschichte der Stadt Erfurt* (Erfurt, 1900).

ERG, ĕrg (abbreviated from the Gk. *ἔργον, ergon,* work; connected with Av. *varaz,* to do, Goth. *waúrkjan,* AS. *wyrcean,* OHG. *wirkan,* Ger. *wirken,* Eng. *work*). The unit of work or energy on the C. G. S. system (q.v.). It is the work done when a force of one dyne acts through, or is overcome through, a distance of one centimeter. It is also the energy of two grams moving with a unit speed. (See Energetics.) Since it is so small a unit, a multiple of it, viz., 10^7 ergs, the so-called "joule," is used more generally. See Mechanical Units; Mechanics; Calorimetry.

ER'GASTE'RIA. See Laurion.

ERGOT, ẽr'got (Fr. *ergot, argot,* spur, extremity of a dead branch). A name given to the peculiar, hard, purplish-black bodies that sometimes replace the grain in the head of rye or other grasses. These ergots are the result of the development of the fungus *Claviceps purpurea* and other species within the ovaries of the grasses. The sclerotia, as the hard bodies are called, are usually solid, are white within, and when fresh have a peculiar waxy or oily appearance and a heavy characteristic odor. Those produced on rye and some other grasses may be many times larger than the seed which they replace, attaining a length of an inch or more; but in wheat and in some of the smaller grasses they are smaller than the seed and may not be noticed until crushed, when they are recognized by their odor. The fungus origin of ergot has been more or less understood since 1838, but its true cause and the life history of the organism were unknown until Tulasne published the results of his investigations in 1853. If a grain of ergot be placed in suitable conditions of moisture and temperature, it will soon send out a number of small stalks, each surmounted by small globular heads which contain a multitude of spores. In nature these are produced from ergot sown with the grain, or from that which has fallen to the ground where it wintered, the spores maturing about the time the grass is in flower. The ripened spores are blown about by the wind, and some find lodgment upon the styles of the grass. Here they germinate and find their way into the ovary of the flower, where they develop an abundant mycelium and put out many short branches, each of which produces a single conidium. At the same time a sweet, milky juice is secreted, called honeydew, in which the conidia float about until carried away by insects visiting the flower for this sweet substance. When taken to another flower, the conidia germinate and set up a new infection similar to that already described. During all this time the fungus within the flowers continues to grow and forms a dense mass of hyphæ, completely obliterating the seed whose place it occupies. Later, the formation of conidia ceases, and the fully grown mycelium is transformed into a sclerotium, the dark-colored ergot, which, when mature, falls to the ground or is harvested with the grain.



ERGOT.
Represented by the two black masses.

Ergot is a powerful emmenagogue, ecbolic, and hæmostatic, and is poisonous to human beings and higher animals, and occupies an important place in medicine. For this purpose the ergot of rye is preferred, the principal supplies coming from Germany, Russia, and Spain. In some regions where ergot is abundant its presence in grain often makes flour injurious unless the grain be thoroughly screened before grinding. The most conspicuous constituent of ergot is a heavy, nondrying, inflammable fixed oil, soluble in ether, which is present to the extent of 30 per cent or more. This is now considered as inert. There is also about 7 per cent of resin, which is of no medicinal value. It is claimed that two alkaloids have been isolated—ecbolin or cornutin 0.16 per cent, and ergotin 0.12 per cent—and that the active principles are contained in these compounds, the former being much the more powerful. Dragendorff and Podwissotzky discredit the active properties of ecbolin and ergotin, believing them to be formed by chemical action and heat and not occurring in the ergot normally. They have found 4.5 per cent of sclerotic acid and 2 to 3 per cent of scleromucin in ergot, which they claim to be the principal active constituents. Sclerotic acid is an amorphous, yellowish-brown, inodorous, and tasteless substance, soluble in water, while scleromucin is darker and insoluble in water after once being dried. Another active principle is sclererythrin, which is present in small quantities. According to Kobert (*Lehrbuch der Toxikologie für Thierärzte*, 1890), the active constituents of ergot are cornutin (an alkaloid), sphacelic acid, and ergotic acid. The uterine contraction is due to the cornutin, while the poisonous properties of ergot, which often result in gangrene, are due to the sphacelic acid. The ergotic acid is a glucoside which has narcotic properties and diminishes and finally stops reflex excitability. Ergot is usually administered as a fluid extract of ergotin, which is made in various ways, as a wine of ergot, etc., and, as already stated, when used in considerable quantities is poisonous. See Ascomycetes.

ERGOT FUNGUS. See Ergot.

ER'GOTISM. A disease of cattle, horses, and sheep caused by eating toxic quantities of ergot on grasses (q.v.). The effects are impaired general vitality and circulation of the blood, which latter, usually in the legs, may stop entirely and be followed by swellings below the knee or hock, with perhaps subsequent death of, or gangrene in, the part. Less typical symptoms of a constitutional nature are indigestion, nervousness, dementia, stupor, coma, or twitching and paralysis of the voluntary muscles, beginning with the tongue and extending to other parts. Epidemics of ergotism have occurred in Europe, following cold, damp seasons, in which meteorological conditions favor the propagation of ergot. In such outbreaks not alone are domestic animals affected, but the ill-fed poor of cities have also suffered severely from eating bread made from infected grain. It has to be differentiated from mycotic stomatitis.

Treatment consists in a change of food, local antiseptics, tannin internally to neutralize the unabsorbed alkaloids of the ergot, and castor oil. Chloral hydrate may be given internally and hot water applied locally to dilate the blood vessels.

ER'IC. The name of several kings of Sweden and Denmark, before and after the union of the two kingdoms in 1397.—Several Erics, mainly of legendary fame, are said to have ruled in Sweden before St. Eric, who is accordingly styled the ninth. Eric the Victorious, who died about 995, was the last heathen king and is styled the seventh Eric.—St. Eric (c.1150–60) Christianized upper Sweden and built a number of churches and monasteries. He undertook a crusade against the Finns, which resulted in the long and intimate connection between the two countries. Eric also compiled an excellent code of laws known as St. Eric's Lag, which granted to women the right of inheritance of one-third and certain privileges within their households.—Eric X (1210–16), grandson of St. Eric, is the first King mentioned as being crowned. For a time he had been an exile in Denmark.—

The most important events in the reign of ERIC XI (1222–50) were his enforced exile for five years; the successes achieved against the Finns; the imposition of celibacy on the clergy at the Synod of Skenninge in 1248, and the invasion of Russia, which was checked by Alexander Nevski. Under this King Birger Jarl, of the family of Folkungar, rose to be the virtual ruler in the state, and after the death of Eric the royal crown was placed upon Birger's son Waldemar.

In Denmark ERIC I (1095–1163) won the name of the "always good" by his excellent rule and character.—In the twelfth century ERIC EMUN (1134–37) waged continual war against his piratical neighbors, whom he sought to Christianize.—ERIC THE LAMB, a King of mild and gentle character, crippled the power and resources of the crown by his easy-going policy. He abdicated and retired to a cloister, where he died in 1147.—The three Erics (ERIC VI, VII, and VIII) who occupied the throne with only the intermission of a few years, from 1241 to 1319, are associated with one of the most disastrous periods of Danish history. Long minorities, the practice of dismembering the crown lands in favor of younger branches of the royal house, and a futile struggle between the ecclesiastical power and the state, weakened the crown to the last degree. Eric VI Plogpennig (1241–50), and Eric VII Glipping (1259–86), were both assassinated, the former at the instigation of a brother, and the latter in revenge for a private injury. Eric VIII (1286–1319), the last of the name before the union of Kalmar, died childless, and was succeeded by his ambitious brother Christopher, who lost his powers and prerogatives one by one, and was finally forced to flee from Denmark. Margaret, daughter of Waldemar IV of Denmark, by marriage with Hako, King of Norway, united the countries, and through her wise rule in those countries was enabled to secure the crown of Sweden also. By the union of Kalmar, in 1397, her nephew, ERIC of Pomerania, was recognized as her successor. On the death of Margaret, in 1412, Eric therefore became King of the triple kingdom of Scandinavia. His reckless disregard of treaties and oaths, his neglect of his duties, and his misdirected ambition, led to dissensions and maladministration. In consequence, in 1439, the Danes renounced their allegiance, and in the next year Sweden did the same. Denmark chose Christopher of Bavaria in his stead; but Scandinavia, for many years afterward, was a scene of intestine wars and dissensions, as a result of Eric's misrule. Eric fled to Gothland and for 10 years led the life of a pirate. He had married Philippa, daughter of Henry IV of England, a noble-spirited woman, whom it is said he treated cruelly. He died in 1459.

ERIC XIV, the last of the name who ruled in Sweden, was one of the weakest and most unfortunate of the Erics. He succeeded his father, Gustavus Vasa, in 1560. The kingdom was in an excellent condition as the result of the wise rule of his father. Eric was well educated, and a number of useful reforms were introduced in his reign. He made the first attempt to establish a supreme court and invited the oppressed Protestants to his land, many Huguenots accepting his offer. On the other hand, his fickleness and constant suspicion of others not only alienated the affections of his subjects, but prevented the growth of a strong government. Elizabeth of England and Mary of Scotland were more than once the objects of his matrimonial schemes. Finally, he married his mistress, a Swedish peasant girl, who exercised great influence over him, especially during his attacks of insanity. The nobility at last rebelled, and the estates in 1568 deposed Eric and chose his brother John as King. Eric suffered the most rigorous confinement, and the frequent conspiracies to free him only made his lot the harder. To remove all danger, John caused his brother to be poisoned in 1577. See DENMARK; SWEDEN.

ER′ICA′CEÆ (Neo-Lat., from Gk. *ἐρείκη*, *ereikē*, *ἐρίκη*, *erikē*, heath). A family of dicotyledonous plants, the heath family, which consists chiefly of small shrubs, but which contains some trees. The leaves are alternate, opposite, or in whorls, entire, destitute of stipules, often small, in some genera mostly evergreen and rigid. The flowers are sometimes solitary in the axils of the leaves, sometimes grouped in different kinds of inflorescence, and are often of great beauty. The calyx is four or five parted, and the corolla, which is often bell-shaped, has four or five lobes. The stamens are as many or twice as many as the corolla lobes, and the anthers in most genera open by small pores at the summit. The ovary is four to five celled, and one to many seeded. The fruit is a capsule or a berry. About 50 genera and 1400 species are known, of which the greater number are natives of South Africa, which particularly abounds in species of the genus *Erica* and its allies, the true heaths. Some of them are also found at the utmost limits of northern vegetation. They are rare within the tropics and occur only at considerable elevations. Few species are found in Australia. Many of the Ericaceæ are social plants, and a single species sometimes covers a great tract, in which it constitutes the principal vegetation. This is most strikingly exemplified in the heaths of Europe and the north of Asia.

The family contains many well-known forms in North America, as the wintergreens (*Pyrola* and *Gaultheria*), the curious Indian pipe (*Monotropa*), trailing arbutus (*Epigæa*), bearberry (*Arctostaphylos*), huckleberries (*Gaylussacia*), blueberries and cranberries (*Vaccinium*), rhododendrons and azaleas (*Rhododendron*), mountain laurel (*Kalmia*), etc. See AZALEA.

ERICHSEN, ĕr′ĭk-sen, SIR JOHN ERIC (1818–96). An English surgeon, born in Copenhagen. He received his medical education at the University College, London, and in Paris, and in 1844 became lecturer on anatomy and physiology at Westminster Hospital. In 1848 he became assistant surgeon, and in 1850 surgeon in charge of the University College Hospital, serving also as professor of surgery from 1850 to 1866, and Holme professor of clinical surgery from 1866 to 1875. He was president of the Royal College of Surgeons in 1880, was elected a fellow of the Royal Society in 1876, and was created a baronet in 1895. He is best known for his textbook on the *Science and Art of Surgery* (1st ed., 1853), which was translated into German, Italian, and Spanish, and is still considered one of the standard textbooks of surgery in the greater part of the world.

ERICHT (ĕr′ĭkt), LOCH. A lake in the northwestern part of Perthshire and south of Inverness-shire, Scotland, in a wild, uninhabited district, amid the Grampian Mountains (Map: Scotland, D 3). It is 14 miles long by 1¼ to 1⅛ miles broad and its surface is 1153 feet above sea level. Its banks rise steeply from the water's edge. It empties into Loch Rannoch, and its waters ultimately reach the Tay. The lake is noted for salmon and trout. In a cave at the south end Prince Charles found safe concealment in 1746, after the battle of Culloden.

ER'ICHTHO'NIUS (Lat., from Gk. *'Εριχθόνιος*). 1. The son of Dardanus and Batea, father of Tros, and ancestor of Æneas. 2. The son of Hephæstus, identified with Erechtheus (q.v.).

ER'ICSON, Leif. A probably historic personage whose adventures are described in the Icelandic sagas. He was the son of the Norseman Eric the Red and about 1000 A.D. discovered a land to the west, which he called Vinland (Vineland). The site of the early settlement has been variously placed along the Atlantic seaboard—on Labrador, on Newfoundland, and on the mainland farther south. Consult *The English Rediscovery and Colonization of America* (London, 1891).

ERICSSON, John (1803–89). A distinguished engineer. He was born in the Parish of Fernebo, Vermland, Sweden, July 31, 1803. After serving for some time as an officer of engineers in the Swedish army, he removed in 1826 to England and continued to occupy himself with inventions, chiefly improvements in steam machinery. While in England Ericsson patented a new form of screw propeller, and it was largely through his efforts that the screw came to be generally adopted for navigation. The Admiralty and British naval engineers did not become interested in Ericsson's work; but his ideas were appreciated by F. B. Ogden, United States Consul at Liverpool, who placed at his disposal funds to construct a small ocean steamer, which was subsequently sent across the Atlantic. Mr. Ogden and Capt. Robert F. Stockton, U. S. N., induced the engineer to come to the United States, and he received the orders for the construction of two steamships. He arrived at New York in 1839, and two years afterward was employed in constructing the U. S. S. *Princeton,* which was the first war steamship to have its propelling machinery below the water line and to use the screw propeller. Ericsson soon became known for the great number and novelty of his inventions, among which, in addition to the screw propeller, were a steam boiler with artificial drafts which did away with smokestacks and effected an important saving in fuel; a steam fire engine; the caloric engine; a sliding telescopic chimney; machinery to check the recoil of heavy guns; an instrument for measuring distance at sea; the hydrostatic gauge for measuring the volume of fluids under pressure; a meter to measure the amount of water passing through pipes; an alarm barometer; a pyrometer to measure temperature, from the freezing of water to the melting of iron; a lead to take soundings without rounding the vessel to the wind; and various modifications of the caloric engine in which the expansive force of hot air was used as a source of power. In the Civil War he designed and built the monitors for the United States Navy. The first one was built in a little more than three months and (March 9, 1862) defeated and disabled the Confederate ironclad *Merrimac.* In his later years he attempted to perfect the solar engine, for which heat is obtained from the rays of the sun collected by a huge funnel lined with a reflecting surface. He died in New York, March 8, 1889. In 1890 the body of Ericsson was removed to Sweden, being conveyed by the United States cruiser *Baltimore,* and in 1893 the State of New York erected a monument to him on the Battery, New York City. This was replaced by another in 1901. Consult Church's *Life of Ericsson* (New York, 1890).

ERICSSON, Nils (1802–70). A Swedish engineer. He was born in Stockholm and was the eldest brother of John Ericsson, who built the *Monitor,* the first successful ironclad in the United States navy. In 1850 he was appointed colonel of the Naval Engineering Corps, and in 1858 became director of government railroad construction, in which capacity he probably contributed more than any other man to the development of the present railroad system of Sweden. As a hydraulic engineer, he constructed the docks at Stockholm, the great canal uniting Lake Saima with the Gulf of Finland, and the new sluices of the Trollhättan Canal.

ERIC THE RED (c.950–1000). The colonizer of Greenland. He was a native of Norway and fled from the country under a charge of homicide, settling on the west coast of Iceland. Another murder forced him (c.980) to flee to an island in the west which had been discovered more than a century before, but not settled. In 985 Eric returned to Norway and secured colonists for the new land, which he called Greenland. He became the leading man of the colony and called his chief town Gardar. His son, Leif Ericson (q.v.), introduced Christianity and is supposed to have landed on the New England coast about the year 1000. Eric has by some been credited with the discovery of America. In the eleventh century Greenland became tributary to Norway. After flourishing for about four centuries the settlement suddenly disappeared from history, all communications, commercial and otherwise, being mysteriously broken off. It is sometimes supposed that all of the people were carried off by the black death in the fourteenth century. Consult Nansen, *In Northern Mist*[illegible] (2 vols., New York, 1911).

ERIDANUS, ė-rĭd'ȧ-nŭs (Gk. *Ἠρίδανος,* Eridanus, a river god, son of Oceanus and Tethys). An ancient southern constellation, mentioned by Eudoxus in the fourth century B.C. It lies immediately south of Taurus and extends more than halfway to the south pole. Its principal star, *a Eridani,* or Achernar, is of the first magnitude. o_2 *Eridani,* a star of magnitude 4.5, has a faint and distant double satellite, and was first recognized as a triple system by Herschel in 1783; it is remarkable also for its large proper motion.

ERIDANUS. See Electrides; Po.

E'RIE. A city and the county seat of Neosho Co., Kans., 120 miles south-southwest of Kansas City, on the Missouri, Kansas, and Texas, and the Atchison, Topeka, and Santa Fe railroads (Map: Kansas, G 7). It is in the valley of the Neosho, the centre of a fertile agricultural region, and has a large oil refinery, an ice factory, a mineral-water plant, grain elevators, and feed mills. There are natural-gas and oil wells in the vicinity. The water works and electric-light plant are owned by the city. Pop., 1900, 1111; 1910, 1300.

ERIE. A manufacturing city, port of entry, and the county seat of Erie Co., Pa., on Lake Erie, 88 miles by rail southwest of Buffalo, N. Y., and 95 miles northeast of Cleveland, Ohio (Map: Pennsylvania, A 1). The city's supplies of natural gas and its proximity to the bituminous coal and coke districts of the State greatly enhance its commercial and industrial importance. The only lake port in Pennsylvania, Erie has an excellent harbor, protected by a peninsula 6 miles long and 1 mile wide, called Presque Isle. It receives a large part of the shipping of the Great Lakes and is also important as a railroad centre, being on the Bessemer and Lake Erie, the Lake Shore and Michigan Southern, the New York, Chicago, and St. Louis, the Pennsylvania, and other railroads. Its lake freight commerce carries products valued at more than $150,000,000, in 3000 American and foreign vessels annually, while its railroad freight tonnage is equivalent to 200,000 loaded cars. Besides the trade in coal and iron ores, there are extensive fisheries and a heavy commerce in grain, package freight, and agricultural products.

Erie's manufactures are considerable and varied. They give employment to about 15,000 men and represent an invested capital of $36,694,500. The annual output is valued at more than $30,000,000. The principal industrial establishments include engine and boiler works, blast furnaces, electrical-cars and machinery factories, iron, brass, and aluminium foundries, machine and tool shops, malleable-iron works, refineries, chemical works, tanneries, horseshoe and hardware plants, paper, flour, silk, and woolen mills, and manufactories of bicycles and automobiles, pianos and organs, beer, cigars, tobacco, medicines, etc. The city has many beautiful parks, a public library, three general hospitals, a sanitarium, eight homes for children and aged persons, a Federal building, a courthouse, a city hall, St. Benedict and Villa Maria academies, two cathedrals, St. John Kanty College, and a State soldiers' and sailors' home, whose park near the harbor entrance is the site of the old French and Indian War frontier blockhouse fort, where Gen. Anthony Wayne died in 1796. Erie, under a charter of 1913, is governed by a municipal commission of the mayor and four commissioners. These, with the city controller, are elected by popular vote on a nonpartisan ticket. Other officials are chosen by the commission, excepting the board of municipal waterworks, which is appointed by the judges of the county court of common pleas. Legislative initiative by 100 qualified voters and referendum by petition of 20 per cent of the electors are provided. The school affairs are managed by a board of nine directors, elected by popular vote. The city's receipts in 1914 were $1,100,000, while its payments amounted to about $1,337,000, the principal items of expense being $490,000 for schools, $115,000 for the fire department, and $100,000 for the police. The water works, valued at $3,520,000, and having a pumping capacity of 44,000,000 gallons daily, are owned by the municipality and operated at a yearly expense of $120,000. The assessed property valuation of the city in 1913 was $48,513,000.

On the site of Erie stood the old French fort, Presque Isle, built in 1753. In 1760 the English took possession of it, and on June 22, 1763, during Pontiac's War, a large force of Indians compelled the garrison to surrender. Erie was the headquarters of Commodore Perry in the War of 1812, and the two flagships, the *Lawrence* and the *Niagara*, with which he defeated the British in the naval battle of Lake Erie, off Put-in-Bay, were built and equipped here. The town was laid out and settled in 1795 by families from New England and was chartered as a city in 1851. Pop., 1900, 52,733; 1910, 66,525, including 14,943 of foreign birth and 340 negroes; 1914 (U. S. est.), 72,401; 1920, 93,372.

ERIE. An Iroquoian tribe, formerly holding the east and southeast shores of the lake of that name, in the present States of New York, Pennsylvania, and Ohio. They were nearly destroyed by the Iroquois about 1656, in a short but fierce war of conquest, those who survived being incorporated with the Senecas. The name is said to signify a wildcat.

ERIE, BATTLE OF LAKE. A famous naval engagement in the War of 1812, between Great Britain and the United States, fought in Put-in-Bay, near the western end of Lake Erie, on Sept. 10, 1813. The American fleet, which had been hastily built at Presque Isle (now Erie), Pa., consisted of 3 brigs, 5 schooners, and a sloop, with a total of 54 guns, throwing a broadside of 936 pounds, and 490 officers and men. The British had 2 ships of war, 2 brigs, a schooner, and a sloop, mounting 63 guns, throwing a broadside of 459 pounds, and carrying about 460 officers and men. The American guns, though of heavier calibre, were of shorter range than those of the British. The American commander was Oliver Hazard Perry, then ranking as master commandant; the British commander was Robert H. Barclay, who had served under Nelson at Trafalgar. During the first part of the battle the English concentrated their fire on Perry's flagship, the *Lawrence*, which was soon so completely disabled that Perry left her in command of Lieutenant Yarnall and shifted his flag to the *Niagara*, under a heavy fire. The action now became general, and after a stubborn contest Perry forced Barclay's flagship, the *Detroit*, and three other vessels to surrender. The remaining two attempted to escape, but were soon overtaken and captured. Perry at once sent his famous dispatch to General Harrison: "We have met the enemy, and they are ours—two ships, two brigs, one schooner, and one sloop." The battle lasted three hours and fifteen minutes, and during this time the Americans lost 123 in killed and wounded; the British, 135. This victory gave the Americans almost undisputed control of the upper lakes, and not only removed all danger of invasion in that quarter, but virtually insured the recapture of Detroit and the conquest of Upper Canada by the American army under General Harrison. Gold medals were conferred by Congress upon Perry and Master Commandant Elliott, and minor rewards upon the other officers and men. In 1858 the remains of the officers killed were buried on Put-in-Bay Island. There has been much discussion among naval historians in regard to the relative strength of the two fleets and the precise amount of credit to be awarded to Perry. See PAGEANTS AND CELEBRATIONS for account of Centennial Celebration. Consult: Roosevelt's *Naval War of 1812* (New York, 1882); Spears, *The History of Our Navy* (ib., 1899); Maclay, *History of the Navy* (ib., 1894–1901); Mills, *Oliver Hazard Perry and the Battle of Lake Erie* (Detroit, 1913).

ERIE, LAKE. The most southern of the chain of five great lakes drained by the St. Lawrence River (Map: United States, Eastern Part, K 2). It lies between Lakes Huron and Ontario, receiving waters from the former through the St. Clair River, Lake St. Clair, and the Detroit River on the west, and discharging its waters into the latter through the Niagara River on the east, at the rate of 215,000 cubic feet per second. Lake Erie has a length of about 250 miles, in a northeast and southwest direction, and a maximum breadth of 57 miles. Its surface, which has an area of 9600 square miles, is 573 feet above the level of the sea and 326 feet above Lake Ontario; its mean depth is about 100 feet, and the greatest depth recorded is 210 feet. It is the shallowest of the Great Lakes. Lake Erie is bounded on the north by the Canadian Province of Ontario, on the east and south by New York, Pennsylvania, and Ohio, and on the northwest by Michigan, the boundary between the United States and Canada traversing it. Besides receiving the drainage from Lakes Superior, Michigan, and Huron, it has a limited river system of its own, receiving among others the Grand from the north, the Maumee from the west, and the Sandusky and Cuyahoga from the south. The chief islands belonging to the United States are West Sister, Rattlesnake, Green, Put-in-Bay, Bass, and Kelly. Those belonging to Canada are Middle Sister, East Sister, The Chickens, Middle, and Pellee.

Navigation on Lake Erie is rendered somewhat difficult, its comparative shallowness making it liable to a heavy ground swell. Navigation is suspended wholly or in part during the winter season on account of the ice. Lake Erie is connected with Lake Ontario by the Welland Canal, around Niagara Falls, with the Hudson River by the Erie Canal, and with the Ohio River by the Miami and Erie and Ohio and Erie canals. Several large cities and important ports are situated on Lake Erie, chief of which are Buffalo, Erie, Cleveland, Sandusky, and Toledo; and Detroit, on the Detroit River, may be added to this list. The growth of these cities —of Cleveland, Detroit, and Buffalo—has been remarkable. The commercial importance of Lake Erie has had rapid increase, as it forms a link in the waterway from the West to the East, over which a great grain and iron movement takes place. Numerous large freight steamers and magnificently equipped passenger steamers ply upon its waters. Lake Erie was an important theatre of naval warfare in the War of 1812. See ERIE, BATTLE OF LAKE; GREAT LAKES.

ERIE CANAL. An artificial waterway across the State of New York, extending from Buffalo to Albany, connecting the Great Lakes with the Hudson River. This canal, second in length only to the great canal of China among the artificial waterways of the world, played a most important part in the commercial development of the State of New York, and probably more than any other influence contributed to the establishment of New York City as the great port and commercial centre of the eastern coast of the United States. In 1784 Christopher Coles made a survey of the Mohawk valley and submitted plans to the New York Legislature for the connection of the Hudson River and Lake Ontario by an artificial waterway. Another survey was made in 1791 by the direction of the Legislature through the efforts of Governor George Clinton, and in 1792 the Western Inland Canal Company was chartered. By the end of 1796 this corporation had built 6 miles of canal at Little Falls to facilitate the use of the upper Mohawk River, and this waterway was navigable by vessels of 16 tons. In 1816 Governor Tompkins urged that the canal be built by the State, and a canal commission, with De Witt Clinton at the head, was appointed. On April 15 the Legislature authorized the construction of a canal, and on July 4 ground was broken at Rome. In October, 1819, a section of the canal from Rome to Utica was open for navigation, and in the following year Seneca Lake was reached. On Oct. 26, 1825, the first canal boat, *Seneca Chief*, left Buffalo for New York, and navigation from the Great Lakes to tidewater was established. The actual cost of the canal was $7,143,789, but by 1836 it had turned into the State treasury more than its cost.

The Erie Canal, as built, was 352 miles in length, with 9 miles of adjuncts, and, considering the time of its construction, was marked by excellent and efficient engineering. It immediately became a source of direct profit to the State, as well as an economic asset of high importance. From 1817 to 1882, when tolls were abolished, the gross revenues of the Erie Canal were $121,461,871, while the cost of operation and maintenance amounted to $29,270,301, showing a profit of $92,191,570. The cost of construction and enlargement in the same period aggregated $49,591,853; so a profit of $42,599,718 was shown. The ratio of operation and maintenance to revenues was 24 per cent. In 1825 the tolls amounted to $566,112, and from the time of its completion the tonnage of freight carried annually soon increased to over 1,000,000 tons, and by 1836 1,301,000 tons were carried. The charge for transportation from Buffalo to Albany, which had been $22 in 1824, fell to $4 per ton in 1835. The original Erie Canal floated boats of 80 feet in length, 15 feet in width, and 3½-foot draft, with a maximum burden of 75 tons; but soon increased capacity was demanded, and in 1835 the enlargement of the canal was authorized. From this time on, politics played an even greater part in the operation and maintenance of the canal. The canal ring was born (see NEW YORK, *History*) and the vast expenditures for maintenance and enlargement led to great corruption and waste. In 1831 the Mohawk and Hudson Railroad opened its line, the era of steam transportation was inaugurated, and 10 years later Albany and Buffalo were connected by rail; but no effect on the business of the canal was felt between 1838 and 1847. In 1848 the State constitution was revised, and from that time on in numerous amendments the question of the canal was more or less before the people. Canal enlargement by 1849 had made passage for vessels of 100 tons burden, and by 1853 vessels of 200 tons could be accommodated. At this period constant efforts were in progress to effect further enlargement of the canal, which by 1862 was virtually completed. The canal was 70 feet wide at the surface, 52 feet wide at the bottom, 7 feet in depth, and accommodated vessels of 6-foot draft and 240 tons, capable of a load of 8000 bushels of wheat, as compared with 1000 bushels at the primitive stage and 2500 bushels from 1830 to 1850. Naturally the cost of maintenance and operation increased with the enlargement and with the inefficiency resulting from political control. In 1867 the land transportation lines began to benefit from increased commercial activity in much greater ratio than the canal, and after the consolidation of the New York Central and Hudson River railroads, in 1869, the advantages of the canal for long hauls were beginning to be lost. The railroads assumed an attitude of opposition to the canal and political influence was wielded against improvements and enlargement, with the result that the Erie Canal began to be neglected, and a lamentable lack of foresight was shown. The canal ring, by this time, had become a public scandal of serious dimensions, and in 1875 it was broken up through the efforts of Gov. Samuel J. Tilden (q.v.). Although the tolls were lowered after the financial crisis of 1873 and were abolished in 1882, the decline of the canal business set in and from about 1880 became phenomenal. With the abolition of tolls came increased neglect, and in no way was the Erie Canal kept abreast of the times, or received the intelligent care and interest such as at this time were given to European canals. Little or nothing was done in the way of improvement until 1895, when an expenditure of $9,000,000 was authorized providing for the deepening of the canal to 9 feet. This amount was entirely inadequate, and the improvement effected was slight, so that after considerable agitation, in 1903, the enlargement of the canal was submitted to the people and its increase in size to accommodate 1000-ton barges was duly voted. This opened a new chapter, both in the engineering and economics of the matter, which will be found discussed under NEW YORK STATE BARGE CANAL. Consult: Hepburn, *Artificial Waterways and Commercial Development*, with history of the Erie Canal (New York, 1909); annual reports of the Superintendent of Public Works of the State of New York; and various reports of canal commissions and committees.

ERIE SHALE. A name given to the westerly extension into Ohio of the Upper Portage and Chemung rocks of New York. It overlies the Huron shale, the latter being the storehouse of petroleum. See DEVONIAN SYSTEM.

ERIGENA, ê-rĭj'ê-nȧ, JOHANNES SCOTUS. A famous mediaeval philosopher, who was born probably of Scot parentage in Ireland (whence *Scotus*, Scot, and *Erigena*, Irish-born) within the first two decades of the ninth century. Very little is known regarding his history. He was called to France by Charles the Bald, who intrusted to him the translation of the writings ascribed to Dionysius the Areopagite (q.v.), his publication of which, without prior submission to the censorship of Rome, brought him into conflict with Pope Nicholas I; but evidently Charles stood by him, since he remained at the French court till the death of the King in 877. Nothing is known of Erigena's history after that date. His philosophic opinions were those of a Neoplatonist rather than of a scholastic. He held that God is the essential ground of all things, from whom all things emanate, and into whom they return again. Nature he regarded as of four distinct sorts: first, the creative and uncreated; second, the creative and created; third, the noncreative and created; fourth, the noncreative and noncreated. The first is God the Creator; the second is the world of ideas existing in God's mind and giving rise to the world of space and time, which is the third; while the fourth is God again as the final goal and consummation of all development. The church doctrine of creation out of nothing he completely changes by making "nothing" mean reality in so far as unknown. God eternally creates the world out of Himself, the Unknown. In logic he was a realist; creation of individual things seems to be nothing but logical subordination of the particular to the universal. As can be seen from this short account of his views, he was not an authoritarian, but insisted that "authority originates in reason, not reason in authority. All authority which is not confirmed by true reason seems to be weak," whereas reason "does not need to be corroborated by the seal of any authority." Erigena took active part in the theological polemic of his day, maintaining the spiritual presence in the Eucharist, and denying Gottschalk's twofold predestination, i.e., both to salvation and to damnation, and admitting only the former. Erigena's main work, his *De Divisione Naturæ*, was condemned by the Provincial Council of Paris in 1210 and ordered by Honorius III in 1225 to be burned. It was first printed in Oxford, 1681. *De Divina Prædestinatione* was printed first in Paris, 1650. His complete extant works were edited by Floss and published in Migne's *Patrologiæ Cursus Completus* (Paris, 1853). Consult: the histories of mediæval philosophy by Haureau, Stöckl, Kaulich, Picavet; Christlieb, *Leben und Lehre des Johannes Scotus Erigena* (Gotha, 1860); Huber, *Johannes Scotus Erigena* (Munich, 1861); Buchwald, *Der Logosbegriff des Johannes Scotus Erigena* (Leipzig, 1884); Wotschke, *Fichte und Erigena* (Halle, 1896); Kaulich, *Geschichte der scholastischen Philosophie* (Prague, 1863); Poole, *Mediæval Thought* (London, 1884) and *Erigena* (ib., 1896); Gardner, *Studies in John the Scot* (ib., 1900); Rand, "Johannes Scotus," in *Quellen und Untersuchungen zur lateinischen Philologie des Mittelalters* (München, 1906); Whittaker, *Apollonius of Tyana and Other Essays* (London, 1906).

ERIGERON, ê-rĭj'ê-rŏn (Lat., from Gk. *ἠριγέρων*, *ērigĕrōn*, the plant groundsel, from *ἦρι*, *ēri*, early, + *γέρων*, *gerōn*, old). A genus of plants of the family Compositæ. It has a powerful odor, which is said to keep away fleas, and the name "fleabane" is sometimes given to the plant. *Erigeron philadelphicus*, with pale-purple ray and a fetid smell, and *Erigeron canadensis*, with inconspicuous rays, are valued in the United States as diuretics. The latter species is now widely diffused throughout the world. The principal constituent of the oil which is distilled from these species is terpene. The oil is a strong hæmostatic, irritant, and stimulant, and is valuable in cases of uterine hemorrhage, diarrhœa, and dysentery.

E'RIN (OIr. *Hériu*, *Eriu*, gen. sg. *Erenn*, dat. sg. *Erinn*, appearing in Gk. as 'Ι*ουερνιά*, *Ivernia*, and in Lat. as *Hiberio* or *Hibernia*; cf. Welsh *Ywerddon*, MBret. *Yuerdon*; perhaps ultimately connected with Skt. *pīvan*, fat, rich, Gk. Πι(*Ϝ*)*ερία*, *Pi*(*v*)*eria*, name of a district in Greece). The ancient name now employed poetically for Ireland (q.v.).

ERIN GO BRAGH, brăʜ (OIr., Ireland forever). The old war cry of the Irish.

ERIN'NA (Lat., from Gk. Ἤ*ριννα*). A Greek poetess of uncertain date. On the basis of a statement in Suidas she has generally been regarded as a contemporary and friend of Sappho, but Reitzenstein in *Epigramm und Skolion* (Giessen, 1893) has shown it to be probable that Suidas's statement is due to the fact that

Erinna wrote songs which were imitations of those of Sappho. Her most probable date is the early Alexandrian period. Among her poems the most famous was "The Distaff" ('Ηλακάτη, *Elakatē*), in 300 hexameters. The fragments of her works are edited by Bergk, *Poetæ Lyrici Græci*, iii (Leipzig, 1900 et seq.). Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (5th ed., Munich, 1908).

ERINYES, ē-rĭn'ĭ-ēz. See EUMENIDES.

E'RIOBOT'RYA. See LOQUAT.

E'RIODEN'DRON (Neo-Lat., from Gk. *ἔριον, erion*, wool + *δένδρον, dendron*, tree). A genus of trees of the family Malvaceæ, or Bombacaceæ according to Engler, natives of tropical countries. The thick, woody seed capsules contain a kind of fibre which resembles cotton, from which the trees are called silk cotton. *Eriodendron anfractuosum*, found in the East Indies, Africa, and also South America, is a tree which reaches a height of 130 feet or more. The African variety or species is called rimi and bentang. Park mentions it by the latter name. Barth says it is generally to be seen growing near the principal gate of large towns in Haussa. Its wood, soft and spongy, is chiefly used for making canoes. The roundish seeds, of the size of peas, are eaten in Celebes. The trees of this genus have palmate leaves and large, beautiful flowers. On account of its shortness, elasticity, and brittleness, the fibre cannot be spun like cotton. It is, however, valuable in various ways in upholstery and is used for making floss. The principal supplies come from Java, although the tree is common throughout nearly all tropical regions. In Java it is known as kapok. The silky and lustrous fibre of *Eriodendron samauma* is used in Brazil for stuffing pillows and has been made into many articles. It is said to be a good substitute for beaver in the manufacture of felt hats. Very similar to *Eriodendron* are the species of *Bombax*, a related genus. *Bombax ceiba*, or *Ceiba pentandra*, and *Ceiba munguba* are Brazilian trees of large size. *Ceiba malabarica* is an East Indian species, the fibre of which is reddish; hence the tree is called the red silk-cotton tree. The fibre of these three species is used only for stuffing pillows. It is said that all of them would make good paper. Valuable bast fibres used in making ropes are found in the bark of all species.

E'RIOPH'ORUM. See COTTON GRASS.

ERIPHY'LE (Lat., from Gk. 'Εριφύλη). In Greek mythology, sister of Adrastus, wife of Amphiaraus, and mother of Alcmæon. When Polynices, son of Œdipus, resolved to wage war against his brother Eteocles and so to gain control of Thebes, he bribed Eriphyle with the necklace of Harmonia to persuade Amphiaraus to take part in the expedition. Amphiaraus, who knew that he would die on the expedition, enjoined his sons to kill their mother Eriphyle as soon as they heard of his death. For the execution of this command see ALCMÆON.

E'RIS (Lat., from Gk. Ἔρις). In Greek mythology, the sister of Ares, in the *Iliad*, and daughter of Nyx (night), in Hesiod. Eris, or "strife," is represented by Homer as at first insignificant, but growing until her head touches the heavens. According to the late poets it was Eris who at the marriage festival of Peleus and Thetis flung on the table the golden apple inscribed "To the fairest," for which Hera, Athena, and Aphrodite contended, and which thus brought about the Trojan War. (See PARIS.) The Latin writers give Eris the name of Discordia (q.v.). Hesiod knew another and very different Eris, who spurred men on to honorable rivalry.

ER'ITH (AS. *Ærre-Hyþe*, Old Haven). A town of Kent, England, on the south bank of the Thames, 14 miles east by south of London (Map: London, E 11). It is a favorite suburban residence and a popular starting point for yacht races. In the neighboring marshes are large powder factories. The town owns its electric-light and tramway system and operates them at a profit; it also owns its sewage-disposal plant, a steadily growing group of workmen's dwellings, and in 1909 opened a central store. Pop., 1901, 25,300; 1911, 27,755.

ERITRE'A, *It. pron.* ā'rē-trā'ȧ, or **ERYTHRÆA.** An Italian colony in northeast Africa, lying between the Red Sea on the northeast and Abyssinia on the southwest, and between Anglo-Egyptian Sudan on the northwest and French Somaliland on the southeast, and embracing the northern part of the Abyssinian highlands (Map: Africa, H 3). The coast is about 650 miles long and occupies about one-fourth of the west coast of the Red Sea. The southern portion is a comparatively narrow strip of territory extending inland about 50 miles. The northern section, north of Annesley Bay, extends inland about 200 miles at its greatest width. The colonial territory includes the islands Massawa, Dahlak, and Hauakil in the Red Sea. The total area is approximately 60,000 square miles. Generally speaking, Eritrea consists, first, of the narrow coast territory, which is of coral formation; next, a "subalpine" region with an average elevation of about 2500 feet; and then of a plateau 7000 feet high, broken by arid valleys. These highlands are the most healthful and habitable section of the country and the most susceptible of cultivation, while the sea region is altogether arid and ill capable of supporting life, whether fauna or flora. In this latter district the only rains are in winter. The climate of Eritrea is equatorial, the temperature at Massawa on the Red Sea having an annual average of nearly 90° F. and often rising to 120° F. in the shade. The exports embrace precious metals, animal products, especially hides, mother-of-pearl, pearls, coffee, and ivory. The imports include cotton goods, durra, cattle, wood, wine, and flour. The total value of the imports in 1912 was $3,637,000, for use in the colony, and about $1,000,000 of transit trade; exports, $1,750,000. The imports and exports are almost exclusively at Massawa. There is a considerable transit trade with Abyssinia and Sudan. There entered and cleared, in 1912, 1408 vessels registering 204,400 tons. The only railroad is 75 miles long, connecting Massawa with Asmara, an interior town, the seat of government. This railway was constructed chiefly for military purposes. Additional lines of about 75 miles are under construction, connecting Asmara with other points in the interior. There are about 900 miles of telegraph lines. The seat of colonial government is at Asmara. The chief town is Massawa (q.v.), with a population of 7800 in 1912, the real business centre of the colony and the natural port for Abyssinia. The colony demands annually about $1,250,000 from the national budget. A special army corps of about 4600 men, mostly natives, is stationed here. The population numbers 275,000 natives and 4000 Europeans. The natives are of the

Arab race and chiefly nomadic. The Afar or Danakil tribes inhabit the southern part. The Eritrean frontier was determined by treaties in 1900 and 1902, involving Italy, Abyssinia, and Great Britain. The foundation of this Italian colony began with the purchase in 1870 by an Italian steamship company of Assab as a coaling station, and it was later made an Italian colony. Subsequently treaties were made with the native rulers of other adjacent areas, and they were in 1890 united by royal decree under the title of Colony of Eritrea.

History. Italy, with the consent of Great Britain, obtained a footing in the district of Assab Bay in 1881 and in the next year formed a colony there. In 1885 it occupied the ports of Bailul and Massawa and their contiguous districts, and declared its protectorate over the coast from Ras Kasar to Beheta Bay. A contest with Abyssinia arose in consequence, and the Italian troops were finally forced back upon Massawa in 1887. In 1888 and 1889, however, the Italians regained their position and extended their dominion. After the Italians had with difficulty become possessed of Tigré and other sections, their army was disastrously defeated east of Adowa, on March 1, 1896, by the Abyssinians, to whom was surrendered as a result, under the Treaty of Oct. 26, 1896, all the region south of the Mareb, Belesa, and Muna rivers. In 1897 Kassala was given up to the Anglo-Egyptians. Up to 1898 Eritrea was a purely military department. The Abyssinian success in the war with Italy led her to set up a civil government. By three boundary conventions in 1900, 1902, and 1908 the boundary was finally fixed at approximately 60 kilometers inland. Signor F. Martini (1898–1906) put Eritrea on a sound commercial and financial basis, which continues to exist to-day. Consult Ostini, *La nostra espansione coloniale e l'Eritrea* (Rome, 1913).

ERIVAN, ĕr'ĭ-vän' (Pers. *Revan*). A fortified city of Russian Armenia, capital of the Transcaucasian government of Erivan (q.v.), situated at an elevation of over 3000 feet on the Zanga, an affluent of the Arars, 172 miles south-southwest of Tiflis. It is divided into several parts and is commanded by a fortress situated on a hill (Map: Russia, F 6). The surrounding country has numerous gardens, but it is extremely unhealthful in the summer. Erivan contains five mosques and an Armenian theological seminary. Of interest is the palace of the former Persian viceroys. Leather, pottery, and cotton goods are the chief manufactures. The neighborhood of the city is rich in minerals. The town is an important military station on account of its position near the frontier. Under the rule of the Persians and the Turks, to whom the city belonged alternately, Erivan was of great military importance and was strongly fortified. It was attacked during the Russo-Persian War by the Russians under General Paskevitch (hence his surname Erivanski), and by the Peace of Turkmantchai (Feb. 22, 1828) was formally ceded to Russia. Pop., 1911, 32,505.

ERIVAN. A government in the southern part of Transcaucasia, Russia, bordering on Persia and Asiatic Turkey on the south and covering an area of 10,725 square miles (Map: Russia, F 6). It is a mountainous country, traversed by chains belonging to the Little Caucasus system. There are also isolated peaks, among which Alaghez and Ararat (on the border) are the highest. The government belongs chiefly to the basin of the Aras, which forms the boundary line between Russia and Persia. The largest lake of Caucasia, Goktcha, is situated in the Government of Erivan. The climate varies with the elevation of the surface, but is, on the whole, unpleasant. The forest area is very limited, and salt is practically the only mineral exploited. The lower portions of the country and especially the river valleys are devoted to agriculture, while in the mountainous regions livestock breeding is the chief pursuit. Besides cereals there are raised large quantities of southern fruit and some cotton. Some leather and cotton goods are manufactured. Lake Goktcha has extensive fisheries. The trade is important and carried on mostly by Armenians and Tatars. Pop., 1912, 971,290, consisting principally of Armenians and Tatars, but including also Kurds, Russians, Greeks, and Jews. Capital, Erivan (q.v.).

ERJISH DAGH, ĕr'jĭsh' däG' (anciently. Lat. *Argæus*). An extinct volcano in Asia Minor, situated in the Vilayet of Angora, south of Kaisarieh. It has an altitude of over 13,000 feet, and its latest eruption took place in the fourth century.

ERK, ĕrk, Ludwig Christian (1807–83). A German musician. He was born at Wetzlar and was a pupil of A. André at Offenbach. He was appointed conductor of liturgical singing in the Domkirche at Berlin and founded the Erk Männergesangverein in 1843 and the Erk Gesangverein in 1852. As a teacher he trained many excellent singers, and as a conductor he greatly increased the appreciation of good music among the masses. His popular song books for schools include the following: *Singvögelein* (1896); *Liederkranz* (1839 et seq.); *Deutscher Liederschatz* (5th ed., 1893); and *Turnerliederbuch*. His valuable library and many of his unpublished manuscripts were acquired by the Königliche Hochschule für Musik at Berlin. A large number of these manuscripts, containing hundreds of liturgical and folk songs, consisting of original compositions and historical collections, were subsequently published by Magnus Böhme.

ERLACH, âr'läk', *Ger. pron.* ĕr'läG. A well-known Swiss family, distinguished in the history of Bern.—Walter von Erlach took his name from the village of Erlach near the lake of Brienz. He lived in the twelfth century.—Rudolph von Erlach (?–1360) fought in the battle of Laupen (1339). An equestrian statue of him stands in the city of Bern. His descendant, Johann Ludwig von Erlach (1595–1650), played a distinguished part in the Thirty Years' War as a commander on the Protestant side. Bernhard of Weimar appointed him, in 1638, commandant at Breisach. On the death of Bernhard, in 1639, he entered the French service. He took a prominent part in the battle of Lens under Condé and died a marshal of France.—Jean Louis (1595–1650) was a descendant of another branch of the family. He fought against Germany (1648) and was made a marshal of France in 1650. Several other members of this family afterward achieved distinction as soldiers. Those best known are: Hieronymus von Erlach (1667–1748), in the French and then in the Austrian service, and Karl Ludwig von Erlach (1746–98), who served in the French army and then in the Swiss.

ERLANGEN, ĕr'läng-en. A Bavarian town on the Regnitz, about 15 miles north-northwest of Nuremberg (Map: Germany, D 4). It consists of the irregularly built old town and the modern handsome new town. The latter was founded in 1686, and assigned by the Margrave Christian Ernst of Brandenburg-Bayreuth to the Protestant refugees who were compelled to flee from France on the revocation of the Edict of Nantes. From that time many new branches of industry have been introduced into the town. It has a modern sewerage system and owns water and gas works and a slaughterhouse. Chief among its educational institutions are a nurses' school, the university, built on the site of an old castle (see ERLANGEN, UNIVERSITY OF), and the gymnasium, founded in 1745. The principal manufactures are cotton and woolen goods, wood, glass, tin foil, writing paper, paper boxes, electrical instruments, brushes, metal ware, flour and meal, horn and ivory ware, and gloves. Its breweries are also of importance. Pop., 1900, 22,953; 1910, 24,874. For a period of two centuries and a half after the Reformation Erlangen belonged to the margraves of Bayreuth. In 1791 it became Prussian and in 1810 Bavarian.

ERLANGEN, UNIVERSITY OF. A German university founded in 1742 at Bayreuth, whence it was moved to Erlangen in the following year, and replaced a *Ritterakademie* established in 1699. The patronage of the margraves of Bayreuth, particularly that of Alexander (1769–92), resulted in the refounding of the institution on a much broader basis, under the title it now bears, the Friedrich-Alexander University. It shared the fortunes of the margraviate in the revolutionary and Napoleonic wars and passed successively into the hands of Prussia, France, and finally Bavaria, between 1791 and 1810. About the time of the last transfer the University of Altdorf was united with it, and from that time till about the year 1880 it passed through the usual history of small German universities, distinguished for its strongly Lutheran tendencies. Since that time, however, it has enjoyed great prosperity. New buildings have been added, and the number of its students has more than doubled, there being in 1913 an enrollment of 1360. The library contains 254,000 bound volumes, some 300,000 pamphlets and dissertations, and 2400 manuscripts. Consult: Engelhardt, *Die Universität Erlangen, 1743–1843*; Kolde, *Die Universität Erlangen unter dem Hause Wittelsbach, 1810–1910* (Erlangen, 1910); *Minerva* (Strassburg, 1890 et seq.).

ERLANGER, ĕr′lăng-ĕr, ABRAHAM LINCOLN (1860–). An American theatrical manager, born at Buffalo, N. Y., and educated in the Cleveland (Ohio) public schools. He became a member of a number of theatrical firms and possessed interests in various other amusement companies and corporations. His firms, as part of the so-called "Theatre Trust," gained control of leading theatres in the United States. The Shubert Brothers' interests were incorporated with his in 1907, but were subsequently withdrawn.

ERLANGER, ĕr′läN-zhā′, CAMILLE (1863–). A French composer, born in Paris. In 1880 he entered the Paris Conservatory, where his teachers were Mathias (piano), Bazille and Delibes (composition) He won the Prix de Rome in 1888 with the cantata *Velléda*. This was followed by a number of orchestral works, and in 1894 his dramatic legend *Saint Julien l'Hospitalier* attracted considerable attention. His first opera was *Kermaria* (1897), the success of which was completely eclipsed by *Le juif polonais* (1900). After that he wrote *Le fils de l'étoile* (1904), *Aphrodité* (1906), *Hannele* (1908), *Noël* (1911; produced at Chicago in 1913), *La Sorcière* (1912), and *Gioconda* (1914). He also wrote an impressive Requiem and a symphonic poem, *Maître et serviteur*.

ERLANGER, JOSEPH (1874–). An American physiologist. He was born at San Francisco, Cal., and was educated at the University of California (B.S., 1895) and at Johns Hopkins University (M.D., 1899). Subsequently he was resident house officer in Johns Hopkins Hospital, and fellow in pathology, assistant instructor, associate, and associate professor in physiology (1899–1906) at the university. He filled a professorship in physiology at the University of Wisconsin from 1906 to 1910, when he took up the same duties at Washington University.

ERLAU, ĕr′lou, or EGER. The capital and an episcopal city of the County of Heves, Hungary, about 80 miles northeast of Budapest (Map: Hungary, G 3). The streets are narrow and ill kept, but some of its public buildings are very beautiful. Among these are the large cathedral (1831–37) in the Italian style; the archbishop's palace, with a valuable library; a lyceum built by Count Eszterházy in 1765–85, with a lofty observatory, a library, a town hall, and theatre. There is also a beautiful minaret, the remains of a mosque. It has seven monasteries, the chief being that of the Cistercians. It has two Catholic theological institutions, a library of 50,000 volumes, an English girls' school, a gymnasium, and a teachers' seminary. The industries and commerce of Erlau are important. Production of the red Erlauer wine, which is famous as the best in Hungary, is the main industry. Near Erlau, on a spur of the Almagy Mountains, are the ruins of a castle. In the grounds is the tomb of Dobó, who defended the town against the Turks in 1552. A bishopric was founded here in the eleventh century by St. Stephen. In 1241 the place was destroyed by the Tatars, but was soon rebuilt. It was held by the Turks from 1596 to 1687. Pop., 1900, 25,893; 1910, 28,052.

ERLKÖNIG, ĕrl′kē-nĭk (Ger., from Dan. *ellerkonge, elver-konge*, elf-king). The name given in popular German mythology to a mischievous spirit that deludes men and children by weird rather than playful seduction. The word is properly *Elfenkönig;* its present form is due to Herder's confusing of *Elver-* or *Eller*, the plural of the Danish word *elv*, with *elle*, meaning in German *Erle*, the alder tree. The myth came from Scandinavia through Herder's (q.v.) *Voices of the Peoples*, which gives a translation of the Danish *Erlking's Daughter*. It passed into universal (literature through Goethe's ballad *Der Erlkönig*.

ERLON, JEAN BAPTISTE DROUET, COUNT D'. See DROUET.

ERMAN, ĕr′män, (JOHANN PETER) ADOLF (1854–). A German Egyptologist, born in Berlin, Oct. 31, 1854. His father, Georg Adolf Erman, and his grandfather, Paul Erman, were both professors of physics in the University of Berlin. Adolf Erman was educated at Leipzig and Berlin, and in 1883 was appointed associate professor of Egyptology in the latter university. In 1885 he became director of the Egyptian department of the Royal Museum at Berlin and in 1892 was advanced to the full professorship. Erman's most valuable services to Egyptology lie in the department of Egyptian grammar, and it is due to his labors that this study has been placed upon a truly scientific basis. Among his works which have had a most important influence upon the development of modern Egyptology are: *Die Pluralbildung des Aegyptischen* (1878); *Neuägyptische Grammatik* (1880); *Die Sprache des Papyrus Westcar* (1889); *Die Märchen des Papyrus Westcar* (1890); *Altägyptische Grammatik* (1894; Eng. trans. by Breasted, London, 1894); *Gespräch eines Lebensmüden mit seiner Seele* (1896); *Die Flexion des ägyptischen Verbums* (1900); *Zaubersprüche für Mutter und Kind* (1901); *Aegyptische Religion* (1909); *Aegyptische Grammatik* (1911). Erman's *Aegypten und aegyptisches Leben im Altertum* (1885), translated into English by Tirard under the title *Life in Ancient Egypt* (London and New York, 1894), is the best popular work upon the subject in existence.

ERMAN, Georg Adolf (1806–77). A German physicist, the son of Paul Erman. He was for a number of years professor of physical science in the University of Berlin. In 1828–30 he toured the world for the purpose of making magnetic determinations at different points of the globe. Upon the facts thus ascertained by Erman as a foundation, Gauss built his theory of terrestrial magnetism. Erman published *Reise um die Erde durch Nordasien und die beiden Oceane* (1833–48) and other important works.

ERMAN, Paul (1764–1851). A German physicist, born in Berlin. When the University of Berlin was founded (1810), he was chosen professor of physics and held the office until his death. He made important discoveries in electricity, magnetism, optics, and physiology, and wrote valuable works on these subjects. From 1810 to 1814 he was secretary of the class of physics and mathematics in the Academy of Berlin.

ERMELAND. See Ermland.

ERMENONVILLE, âr'm'-nôN'vêl'. A village in the Department of Oise, France, 34 miles northeast of Paris. Pop. (commune), 1901, 498; 1911, 520. It is the site of the château and beautiful grounds of the Girardin estate, the property of Prince Radziwill, and celebrated as the residence and burial place of Rousseau in 1778. The remains of the philosopher were transferred to the Pantheon in 1794, whence they were secretly removed after the Restoration, and are said now to rest in their original tomb on an island in the park. Ermenonville was also the residence of Gabrielle d'Estrées, mistress of Henry IV.

ERMENT. See Hermonthis.

ERMINE, ẽr'mĭn (OF. *ermine, hermine*, MHG., Ger. *Hermelin*, dim. of OHG. *harmo*, AS. *hearmo*, weasel, Lith. *szermu*, weasel; explained by popular etymology as *mus Armenius*, Armenian mouse). The name, in Europe, of the greater weasel, or stoat, in its white winter dress, when the fur is most highly prized. The term has no popular use in America as a name for the animal, but is applied wholly to the fur. The pelts come to market from British America, Lapland, northern Russia, and Siberia, and are used not only for ladies' winter garments, but for the robes of kings and nobles, and for their crowns and coronets. Ermine has thus obtained a distinct recognition in heraldry, where the arrangement of black points represents the ornamental disposition of the black-tipped tails, which, in making up ermine fur, are inserted in a regular manner, so that their rich black shall contrast with the pure white of the rest of the fur. This came to be a matter for royal regulation in England from the time of Edward III, various ranks of officers being designated by the way the ermine tails were arranged. See Weasel, and Plate of Fur-Bearing Animals.

ERMINE and **ERMINOIS.** Terms for furs used in heraldry (q.v.).

ERMINE MOTH (so called from its markings). An English collector's name for sundry white moths marked with black spots, mostly tineids.

ERMINE STREET. One of the four great Roman roads of England, leading north from London to Lincoln, where it was met by the Fosse, and York, with an extension to Scotland. The lower portion of the road, through Epping and Hainault forests, did not exist until after Roman times.

ERMLAND, ẽrm'länt, or **ERMELAND,** ẽr'me-länt. A diocese in East Prussia, now in the District of Königsberg. After Prussia had been occupied for Christianity by the Teutonic Order (after 1230), the papal legates divided it into four bishoprics, of which Ermland was one. When Riga was confirmed by Alexander IV in 1255 as the metropolitan see of those regions, Ermland was virtually self-governing by virtue of its political independence and was finally acknowledged to be exempt from its jurisdiction; nor could the later archbishops of Gnesen succeed in bringing it under their power. Even the pallium and the archbishop's cross were conceded to its prelates by Benedict XIV in 1742. The early bishops of Ermland were sovereigns in their own districts and, as such, princes of the Empire from 1354, under a certain feudal relation to the grand master of the Teutonic Knights, and from the Peace of Thorn (1466) to the King of Poland. When the latter, however, wished to nominate to the bishopric, as in the rest of his dominions, the chapter vindicated its rights under the earlier concordat of a free election. The most distinguished bishops were Æneas Sylvius Piccolomini, afterward Pope Pius II (1457–58), and Stanislaus Hosias (1551–79), who held his subjects to their allegiance to the Catholic church when the Reformation spread through all the surrounding territory. From 1525 to 1772 the diocese shared the political fortunes of Poland and in the partition of the latter year was assigned to Prussia. The bishopric of Ermland still remains in Prussia, with its seat at Braunsberg. Consult *Zeitschrift für Geschichte und Alterthumskunde Ermlands* (7 vols., Braunsberg, 1858 et seq.), and Hipler, *Analecta warmiensia* (ib., 1872).

ERN, or **ERNE** (AS. *earn*, ONorthum., OHG. *arn*, eagle; connected with Gk. ὄρνις, *ornis*, bird). The sea eagle. The word is rarely heard now except in poetry, though occasionally used in ornithology as a designation of a group differing from true eagles in having naked tarsi and in other minor features. See Eagle.

ERNANI, ĕr-nä'nê. An opera by Verdi (q.v.), first produced in Venice, March 9, 1844; in the United States, November, 1847 (New York).

ERNE, ẽrn. A river and lake in the southwest of Ulster Province, Ireland (Map: Ireland, D 2). The river rises in Lough Gowna, runs north, merging in Lough Oughter, in Cavan County, and after a reach of 10 miles in Upper Lough Erne in Fermanagh County then passes Enniskillen on another reach, whence it is navigable for vessels of 12 feet draft to its outlet, and after flowing through Lower Lough Erne finally empties into Donegal Bay near Ballyshannon. It has a total course of 60 miles. Lough Erne, one of the finest in the kingdom, is the most attractive feature of Fermanagh County, which it bisects. It extends 40 miles from southeast to northwest and consists of two lakes, the upper and lower, joined by a narrower part 10 miles long, with Enniskillen midway between the two lakes. The upper lough is 12 by 4 miles in extent, 10 to 75 feet deep, 151 feet above sea level, and has 90 green hilly islets. The lower lough is 20 by 7½ miles in extent, 100 to 266 feet deep, 148 feet above the sea, and has 109 similar islets. Salmon, trout, pike, bream, and eels abound. The scenery is singularly varied and beautiful, with the added attractions of interesting archæological features. Devenish, one of the largest of the islands, contains the ruins of an abbey and a round tower, one of the most perfect specimens in Ireland. Consult Devenish, *Lough Erne: Its Histories, Antiquities, and Traditions* (Dublin, 1897).

ERNESTI, ĕr-nĕs'tē, JOHANN AUGUST (1707–81). A German classical scholar. He was born at Tennstädt in Thuringia and studied at Schulpforta, Wittenberg, and Leipzig. After having been appointed rector of the Thomas school in Leipzig in 1734, he turned his attention chiefly to classical literature. In 1742 he became professor extraordinarius in the University of Leipzig, in 1756 professor of rhetoric, and in 1759 professor of theology. Ernesti's wide training in philology enabled him to inaugurate a new era in biblical interpretation, and he established a school of New Testament exegesis, based on sounder principles of grammatical and historical interpretation than had prevailed, through his work *Institutio Interpretis Novi Testamenti* (1761; 5th ed. by C. F. Ammon, 1809), translated by Moses Stuart under the title *Elements of Interpretation* (Andover, 1822; 4th ed., 1842). Other theological works are his *Anti-Muratorius* (1755) and *Opuscula Theologica* (1792). As classical philologist, he edited Xenophon's *Memorabilia*, Aristophanes' *Clouds*, Homer, Callimachus, Polybius, Tacitus, and Suetonius, but his greatest classical work was his edition of *Cicero* (6 vols., Leipzig, 1737–39); this contained the *Clavis Ciceroniana*, an excellent dictionary of Cicero's phraseology, with a conspectus of the Roman laws mentioned by Cicero. Consult: Ernesti, *Memoria J. A. Ernesti* (1781); Van Voorst, *Oratio de J. A. Ernesti* (1804); *Allgemeine deutsche Biographie*, vol. vi (Leipzig, 1878); Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

ERNST, ĕrnst (1441–86). Elector of Saxony from 1464 to 1486. He was the eldest son of the Elector Frederick the Mild. At the age of 14 he and his brother Albert were kidnapped (the famous *Prinzenraub*) by a revengeful knight, but were speedily recovered. In 1464 he succeeded his father as Elector, but ruled jointly with his brother Albert till 1485. In that year they divided their paternal possessions, each assuming full sovereignty over his part. Ernst ruled his territory well and increased it by purchase and conquest. The electoral dynasty remained with the Ernestine or elder branch till 1547, when it was transferred to the younger or Albertine line. Ernst died at Colditz in 1486. Descended from Ernst are the present houses of Saxe-Weimar, Saxe-Altenburg, Saxe-Meiningen, and Saxe-Coburg-Gotha.

ERNST (1554–1612). Duke of Bavaria and Elector of Cologne, a son of Albert V of Bavaria. Educated by the Jesuits, his entire life was devoted to extending the counter-reformation in the five bishoprics, in each of which he became Bishop—Freising (1566), Hildesheim (1573), Cologne (1583, after his defeat of Gebhard), Liége (1581), and Münster (1584). He took an active part in the religious and political contests of the period and vigorously opposed the Protestant Leagues.

ERNST I, called the Pious (1601–75). Duke of Saxe-Gotha and Altenburg and founder of the house of Gotha. He was the son of John Duke of Weimar, a member of the Ernestine line. He fought in the Thirty Years' War under Gustavus Adolphus and his own younger brother, the famous Bernhard of Weimar, and distinguished himself in the battles of Nuremberg, Lützen, and Nördlingen. He signed the Peace of Prague in 1635 and thenceforth devoted himself to the administration of his possessions. By his wise and frugal management he raised his country from the economic and moral degradation into which it had sunk during the long war. He fostered industry and commerce, founded many schools and academies, and furthered the spread of religious instruction. He was one of the most enlightened princes of Germany, and his fame spread to Egypt and Abyssinia. Of his sons, Frederick, the eldest, continued the line of Gotha, while Bernhard founded the house of Meiningen, Ernst that of Hildburghausen, and Johann Ernst that of Saalfeld. The line of Frederick of Gotha became extinct in 1825 with the death of Frederick IV; in 1826 the heirs of Ernst of Hildburghausen received Saxe-Altenburg, and those of Johann Ernst of Saalfeld, Saxe-Coburg and Gotha. Consult Philipp, *Ernestus the Pious* (London, 1740), and Beck, *Ernst der Fromme* (Weimar, 1865).

ERNST II (1745–1804). Duke of Saxe-Gotha and Altenburg. He was the second son of Duke Frederick III and of Luise Dorothea of Meiningen. Upon the death of his father (1772) he at once entered upon a thorough reform of the government. Of a noble and charitable disposition, he gave large sums to charity. He refused the considerable sums offered by his kinsman King George III of England for levies to be employed against the American Colonies. He was a liberal patron of all the sciences and was the first to institute a measurement of an arc of the meridian in Germany. He established the astronomical observatory near Gotha and wrote anonymously astronomical works, including *Astronomische Tafeln* (1799). Consult the biography by Beck (Gotha, 1854).

ERNST I (1784–1844). Duke of Saxe-Coburg and Gotha. He succeeded his father in 1806. He fought against Napoleon in the War of 1806 and lost his dominions in consequence, but recovered them by the Peace of Tilsit (1807). He was forced to join the Confederation of the Rhine, but after the battle of Leipzig ranged himself on the side of the Allies, and was rewarded at the Congress of Vienna with the Principality of Lichtenberg, which he sold to

Prussia for 2,000,000 thalers in 1834. In 1826 Gotha came into his hands through failure of the reigning line. He left two sons—his successor Ernst II (q.v.) and Albert, Prince Consort of England. Consult Beck, *Geschichte des gothaischen Landes* (Gotha, 1868).

ERNST II, Augustus Charles John Leopold Alexander Edward (1818–93). Duke of Saxe-Coburg-Gotha, son of Ernst I, and brother of Albert, Prince Consort of England. He was born at Coburg. After studying at Bonn and traveling extensively in Europe he entered the Saxon army. In 1844 he succeeded his father as Duke. Ernst enjoyed immense popularity owing to his habit of mingling with the people in their pleasures, and this, together with timely concessions, saved his territory from revolution in 1848 and 1849. In the war against Denmark he won, as commander of a German corps, the battle of Eckernförde. He favored a united Germany, but looked to Austria as the leader in the movement and bitterly opposed Bismarck. During the years of reaction (1849–52) he was almost the only German prince to remain liberal. In the war between Austria and Prussia in 1866 he, however, sided with the latter, and he took part in the Franco-Prussian War. At his death, without heirs, in 1893, the duchy passed to Prince Alfred, son of Queen Victoria. Ernst was an excellent musician, and some of his operas, among them *Santa Chiara* (1854), *Casilda* (1855), and *Diana von Solanges* (1858), were notably successful in Germany. Under the title of *Aus meinem Leben und aus meiner Zeit* (1887–89) he published memoirs of intense interest; Eng. trans., *Memoirs of Ernst II, Duke of Saxe-Coburg-Gotha* (London, 1888–90). Consult: Ohorn, *Herzog Ernst II* (Leipzig, 1894); Tempeltey, *G. Freytag und Herzog Ernst von Coburg im Briefwechsel 1853 bis 1893* (ib., 1904); Beck, *Ernst II als Pfleger und Beschützer der Wissenschaft und Kunst* (Gotha, 1854).

ERNST, Adolf. See Stern, Adolf.

ERNST, Harold Clarence (1856–1922). An American bacteriologist, born at Cincinnati, Ohio. He graduated from Harvard in 1876 and from the Harvard Medical School four years later. There he served as demonstrator, instructor, and assistant professor between 1885 and 1895, and in 1895 he became professor of bacteriology. He was president of the Boston Society of Medical Sciences from 1898 to 1908 and of the Association of American Pathologists and Bacteriologists in 1908–09. Besides editing the *Journal of Medical Research* after 1896 and contributing scientific and medical articles to other periodicals, he is author of *Infectiousness of Milk* (1896); *Infection and Immunity* (1898); *Animal Experimentation* (1902); *Modern Theories of Bacterial Immunity* (1902).

ERNST, Heinrich Wilhelm (1814–65). An eminent Austrian violinist, born in Brünn, Moravia. In the Vienna Conservatory he studied under Böhm, Seyfried, and Mayseder. He aroused great enthusiasm at his first appearance in 1830 and from 1832 until 1850 spent most of his time in concert tours in Europe and England. His performances were characterized by brilliancy, vigor, and beauty of tone. Ernst's compositions have generally a bravura character and include works for the violin and orchestra, quartets, etc. His *Élégie* is still a favorite work with violinists. Consult A. Heller, *Heinrich Wilhelm Ernst im Urteile seiner Zeitgenossen* (Brünn, 1904).

ERNST, Oswald Herbert (1842–). An American soldier. He was born near Cincinnati, Ohio, studied for two years at Harvard, and then entered West Point, where he graduated in 1864. He served as assistant engineer of the Army of the Tennessee during the Atlanta campaign; was astronomer on the United States commission to observe the solar eclipse of December, 1870, in Spain; was instructor in military engineering, signaling, and telegraphing at West Point from 1871 to 1878, and had charge (1878–86) of the improvements of Western rivers and (1886–89) of harbor improvements in Texas. He was superintendent of public buildings and grounds in Washington, D. C., from 1889 to 1893, was superintendent of the United States Military Academy from 1893 to 1898, became lieutenant colonel of engineers in 1895 and brigadier general of volunteers in 1898, and during the Spanish War went to Porto Rico and commanded the troops in the affair of Coamo (Aug. 9, 1898), receiving the brevet of colonel. He was inspector general of Cuba in 1899, a member of the original Isthmian Canal Commission in 1899, 1901, and 1905, and a director of the Panama Railroad. He retired in 1906, but remained a member of the International Commission on waters adjacent to boundary lines between Canada and the United States. He wrote a *Manual of Practical Military Engineering* (1873) and a *Report* (1904) on the tunnels under the Chicago River.

ERNST AUGUST (1771–1851). King of Hanover. He was born at Kew, the fifth son of George III. He pursued his studies at Göttingen from 1786 to 1791 and, entering the Hanoverian army, fought against France (1793–95). In 1799 he was created Duke of Cumberland in England and became a leader of the High Tories. In 1807 he became grand master of the Orange lodges. On the death of William IV, in 1837, Ernst August as the next male heir succeeded to the throne of Hanover. His reactionary principles made him hated in England, but he was very popular among his Hanoverian subjects. Consult Wilkinson, *Reminiscences of King Ernst of Hanover* (London, 1886), and Morse Stephens, in the *Dictionary of National Biography*.

ERNST KASIMIR, kä′sê-mēr (1573–1632). Count of Nassau-Dietz, a nephew of William of Orange, born in Dillenburg. He entered the Dutch army in 1594 and after fighting in nearly all the campaigns of Maurice of Orange (whom he succeeded as stadholder of Gröningen and Drenthe in 1625) was made a field marshal. In 1620 he became Governor-General of Friesland and in 1625 of Gröningen and Drenthe. In 1621 he fought anew against the Spaniards, conquered Bergen op Zoom and Steenbergen (1622), and fell at Roermonde, June 5, 1632.

ERNST LUDWIG, lo͞ot′vĭk (1868–). Grand Duke of Hesse, born at Darmstadt, a son of the Grand Duke Ludwig IV (1837–92), whom he succeeded in 1892. In 1896 he was made lieutenant general. In 1894 he married Princess Victoria Melita of Saxe-Coburg-Gotha. He divorced her in 1901—she married Prince Cyril of Russia in 1905—and in 1905 the Duke married Princess Eleonore of Solms-Hohensolms-Lich, who bore him two sons, George in 1906 and Ludwig in 1908. In 1909 the Duke's play *Bonifatius* was produced at Darmstadt in the Court Theatre.

E′ROS. See Cupid.

EROS (Lat., from Gk. Ἔρως, Cupid). A planetoid (q.v.) discovered by Witt, of Berlin, in 1898. It is remarkable on account of the fact that it approaches the earth much nearer than any other known body in the heavens except our own moon and possibly certain comets, its distance at opposition being less than 15,000,000 miles. On account of its proximity to the earth, Eros is favorably situated for the determination of the solar parallax (q.v.). During the opposition of 1900 an international campaign of observation was undertaken for the purpose of determining this important constant. Nearly 300 photographs of Eros were secured, which were reduced by Hinks, and the value 8.7966" was obtained. Eros has been found to vary in brightness. In explanation it has been suggested that the planetoid is really double, consisting of two bodies revolving almost in contact with a period of between five and six hours.

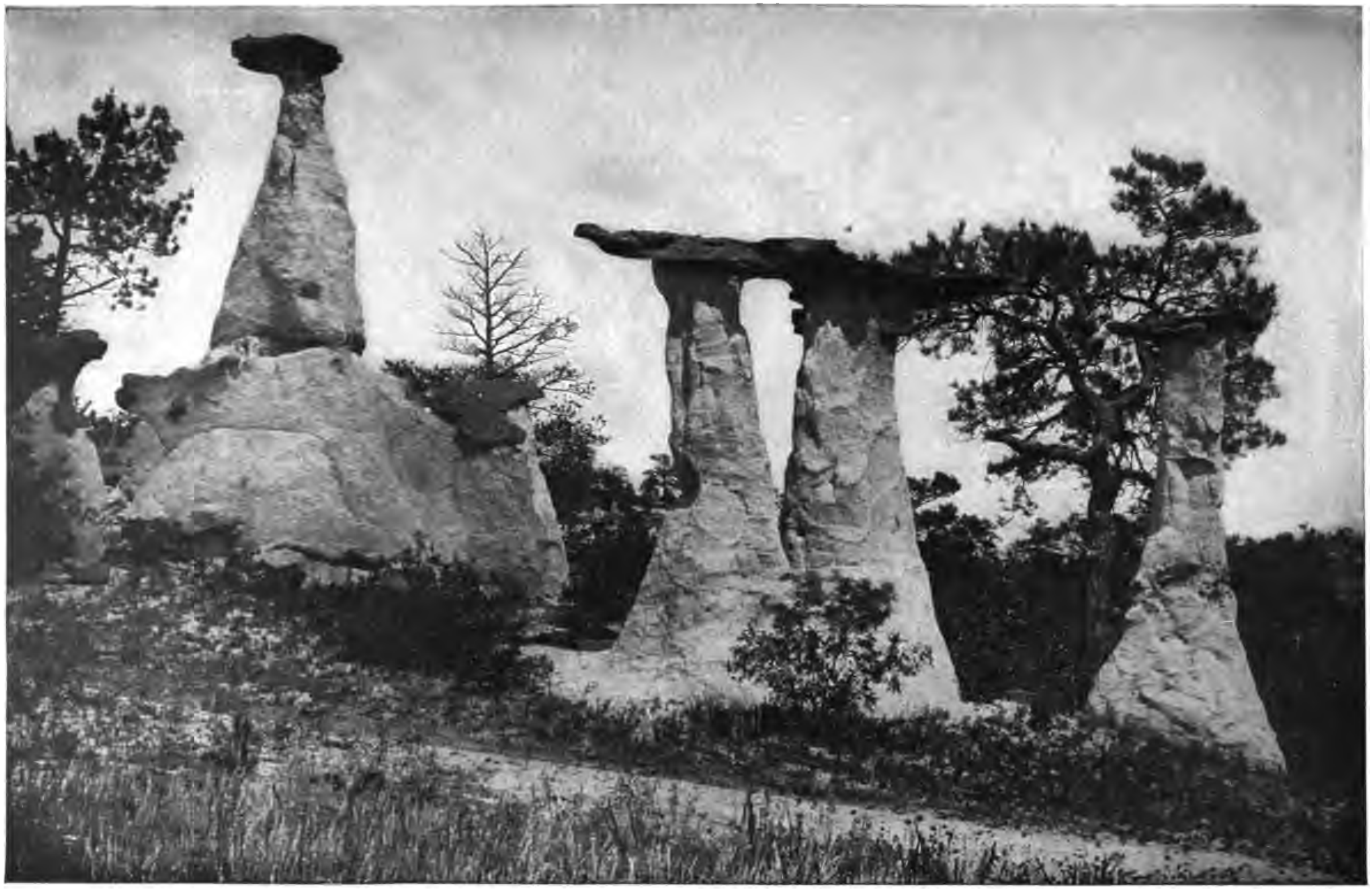
ERO′SION (Lat. *erosio*, from *erodere*, to gnaw, from *e*, out + *rodere*, to gnaw), or DENUDATION. The process by which the surface forms of the earth are sculptured and worn down. The present features of the earth's surface, while they have the appearance of great stability, in reality represent a single stage of development that has been determined by the coöperation of various geological agencies working through long periods of time. Some of these agencies contribute to the erosion or denudation of the land, carving out valleys in plateaus, wearing down mountains, dissecting plains, and generally lowering the level to that of the sea. Rivers are most active in this process. The surface waters supplied by rain and by melting of snow wash the soil and disintegrated rock materials down the slopes of the land into the valleys, where the detritus is carried along by the streams and deposited in their channels or borne to the sea. The solid particles suspended in water exert an abrasive action on the sides and floor of river channels, thus tending to widen and deepen them. A large amount of material is also held in solution and transported in this manner to the sea. The rate at which rivers carry on the destructive work varies in particular regions with the climate, slope of land, and character of rocks. Rainfall, sunshine, and frost, and the chemical action of the atmosphere by means of its carbonic-acid gas, ammonia, and nitrous gases, greatly facilitate the breaking down of rocks, which is a preliminary step to their erosion and transport. The burden carried by the streams of the United States has been estimated by Dole and Stabler to be equivalent to 350,000,000 cubic yards of rock a year, sufficient to lower the whole area one inch in 760 years. The Po is said to remove one foot of rock from its basin in 730 years. This wasting or destruction work of rivers, when continued through long periods of time, must produce great changes. Glaciers, like rivers, are denuding and transporting agents. The weight of the thick masses of ice gives them great erosive power, which is further increased by the rocks carried along the bottom of their beds. At present the occurrence of glaciers in the warmer zones is limited to regions of high elevation, but in past ages it is known that they occupied great continental areas. The Rocky Mountains, the Sierra Nevadas, a large part of the northern United States, and nearly the whole of Canada were once the seat of ice sheets which have profoundly modified the surface features. Another important denuding force is the sea, particularly in the upper portion, where the water is kept in motion by waves, tides, and currents. Wave action breaks down cliffs and gives to the coast lines of continents a constantly changing form. Tides carry seaward the sediment brought down by rivers to their mouths.

The immediate effect of erosion is to produce a variety of contour on land surfaces. The forms or types of scenery exhibited in any one locality depend upon the combination of factors at work and the material exposed to their action. A level land area composed of rocks unequally resistant to abrasion must in time be carved into a series of hills and valleys, the position of which will depend upon the relative disposition of the harder and softer materials. In the process of land sculpturing it is also necessary to consider the predominant erosive agencies, which will vary in different regions and in different climates. Arid districts, like the Bad Lands of South Dakota and the plateaus of Arizona, have peculiar types of scenery that cannot be found in countries having a heavier rainfall. The general tendency of erosion is to reduce the level of continents to that of the sea (base level). This destructive process is offset in a measure by movements of the earth's crust which repair what has been lost by superficial waste. The amount of material removed from the land is represented by an equivalent accumulation beneath the sea, and by upheaval this accumulation may be raised above water level. The activity of the two processes, antagonistic in their effect, is illustrated by the areas of stratified rocks, such as sandstones, shales, limestones, which form by far the larger portion of the surface of continents. Consult: Geikie, *Text-Book of Geology* (London, 1903); Davis, *Physical Geography* (Boston, 1900); Gilbert, "Geology of the Henry Mountains," *United States Geological Survey Reports* (Washington, 1877); Chamberlin and Salisbury, *Geology*, vol. i (New York, 1909). See PHYSIOGRAPHY; GEOLOGY; MOUNTAIN; SHORE; CONTINENT; ETC.

EROS′TRATUS. See HEROSTRATUS.

EROT′OMA′NIA (Neo-Lat., from Gk. *ἐρωτομανία*, love-mania, from *ἔρως*, *erōs*, love + *μανία*, *mania*, madness). An unfortunate term applied to a class of patients suffering from paranoia (q.v.), in whom the morbid ideation centres around some real or imaginary object of platonic love. These patients are generally hypochondriacal and religious as well as erotic and have various expansive ideas.

ERPE′NIUS (1584–1624). The Latin form of the name of Thomas van Erpe, one of the earliest and most eminent of European Orientalists. He was born at Gorkum, in Holland, Sept. 11, 1584. At an early age he was sent to Leyden, where he directed his attention to theology and to the study of Oriental languages. Having completed his course, he traveled through England, France, Italy, and Germany, and returned to Holland in 1612. In 1613 he became professor of Oriental languages at Leyden. The professorship of Hebrew not being vacant at this time, a second Hebrew chair was founded expressly for him in 1619. Soon after this he was appointed Oriental interpreter to the government. Towards the close of his life tempting offers of honors and distinction came pouring in upon him from all parts of Europe; but he was never prevailed upon to leave his native country, where he died Nov. 13, 1624. His works are: *Grammatica Arabica Quinque Libris Methodice Ex-*



EROSION

"THE DUTCH WEDDING" IN MONUMENT PARK

plicata (1613); *Rudimenta Linguæ Arabicæ* (1620); *Historia Saracenica Auctore Georgio Elmacino* (1625); *Proverbiorum Arabicorum Centuriæ Duæ* (1614); *Locmani Sapientis Fabulæ* (1615).

ERRAN′TIA (Lat., wandering, from *errare*, to wander). A group of polychætous annelids, characterized by their active manner of life. See Annulata.

ERRARD, âr′răr′, Charles (1606–89). A French painter and architect, born at Nantes. He studied under his father, Charles Errard the Elder (1570–c.1635), an historical and portrait painter, and in Rome, where many of the early years of his life were spent. Upon his return to France (1643) he was employed by Louis XIV to decorate the Louvre, Tuileries, and other palaces. The paintings of Errard have all been destroyed, excepting an allegorical painting in the Museum of Reims. The best-known example of his architecture is the church of the Assumption in Paris (1676). He also illustrated the *Parallèle de l'architecture ancienne et moderne* (1666), written in collaboration with M. de Chambray, and designed numerous antique ornaments and vases. But, as painter, architect, and draftsman, his style was heavy and lacking in character, his chief claim to remembrance being that he was one of the 12 original members of the Académie de Peinture et de Sculpture, in 1648, and was prominently instrumental in the establishment of the French Academy at Rome, of which he was the first director (1666).

ERRAT′ICS. See Boulder, Erratic.

ERRERA, ĕr-rā′rȧ, Alberto (1842–). An Italian political economist, born in Venice and educated at Padua. He held professorships of political economy and statistics at the technical schools of Venice, Milan, and Naples, and at the University of Naples. Among his published works, several of which are of permanent value, are: *Storia e statistica delle industrie venete* (1870); *Storio dell' economia politica nei secoli XVII e XVIII negli stati della republica Veneta* (1877); *Demografia* (1892); *Lezionidi economia politica* (1892).

ER′RETT, Isaac (1820–88). A clergyman of the Disciples of Christ, born in New York City. He began to preach in 1840 and for many years was secretary or president of several of the missionary societies of his church. From 1866 he was editor of the *Christian Standard* (Cincinnati). He died in Cincinnati, Dec. 19, 1888. His books include: *Walks about Jerusalem* (1872); *Talks to Bereans* (1875); *Evenings with the Bible* (1884–87). For his life, consult Lamar (Cincinnati, 1894).

ERRHINES, ĕr′rīnz (Gk. *ἔρρινον*, *errhinon*, errhine, from *ἐν*, *en*, in + *ῥίς*, *rhis*, nose), or Sternutatories. Medicines formerly administered locally to produce sneezing and discharge from the nostrils, in catarrh. Common snuff and other vegetable irritants are so used.

ERROR (Lat. *error*, from *errare*, to wander). In observations of every kind errors are unavoidable. As in astronomy and other exact sciences correctness in the result of instrumental measurements is of the first consequence, it is the constant care of the observer to detect and make allowances for errors. The three principal sources from which errors may arise are: 1. External or incidental causes, such as fluctuations of weather, which disturb the amount of refraction; changes of temperature, affecting the form and position of instruments, etc. 2. Errors of observation, being such as arise from inexpertness, defective vision, slowness in seizing the exact instant of an occurrence, atmospheric indistinctness, etc.; and such errors as arise from slips in clamping and momentary derangements of the instrument. 3. Instrumental defects, owing to errors in workmanship, and such as arise from the instrument not being properly placed ("errors of adjustment"). The first two classes of errors, so far as they cannot be reduced to known laws, alter the results of observations to their full extent; but being accidental, they necessarily sometimes diminish and sometimes increase them. Hence, by taking numerous observations under various circumstances, and by taking the mean, or average, of the results obtained, these errors may be made to counterbalance one another partially, and to that extent they may be rendered harmless. With regard to the third class, it is the peculiarity of astronomical and physical observations to be the ultimate means of detection of all defects of workmanship and adjustment of instruments, which by their minuteness elude every other mode of detection, and such errors, when found out, can almost invariably be removed. It may be mentioned, however, that the method of subduing errors of the first two classes by the law of average is not applicable in all cases. In certain cases recourse must be had to a system of reduction or calculation, known as the method of least squares. See Least Squares, Method of.

ERROR, Writ of. A common-law process for redressing erroneous judgments, which has been superseded to a great extent in England, as well as in most of the United States, by the process of appeal. A court possessing the power to grant this writ is sometimes called a court of error. In some of our States the court of last resort, whose judgments are not subject to revision by another tribunal, is known as the supreme court of errors. See Court.

The procedure under a writ of error is somewhat similar to that in an original action, the defeated party therein becoming the "plaintiff in error," and the successful party the "defendant in error." The writ recites, in a general way, the cause of the defeated party's complaint, while the *assignments of error* specify the particular mistakes of law alleged to have been made by the lower court. These specifications are denied by the defendant in error, and thus an issue of law is raised for the court of error, the decision of which results either in an affirmance or reversal of the judgment of the lower court. Apart from the difference in the procedure employed, a writ of error differs from an appeal in that it brings up for review only alleged errors of law committed by the trial court, whereas an appeal takes up the whole case for reconsideration by the higher court and may therefore involve the reëxamination of the questions of fact determined in the court below. In the United States the writ of error is the appropriate process for carrying a case from the highest appellate court of a State to the Supreme Court of the United States. See Appeal; Procedure; Pleading.

ERSCH, ĕrsh, Johann Samuel (1766–1828). The founder of modern German bibliography, born at Grossglogau, Silesia. At Halle, whither he was sent to study theology in 1785, he devoted himself also to historical investigations.

After several years of editorial work in Jena, Göttingen, and Hamburg, during which time he held the chair of philosophy, then that of geography and statistics at Halle, he commenced, with Gruber, in 1818 the publication at Leipzig of the *Allgemeine Encyklopädie der Wissenschaften und Künste*, a work of immense value. His *Handbuch der deutschen Litteratur seit der Mitte des achtzehnten Jahrhunderts bis auf die neueste Zeit* (1812–14) is excellent for its time.

ERSE, ĕrs. A name given to Irish Gaelic and also applied by the Lowlanders in Scotland to the people of the Highlands, as will be seen in the thirteenth-century laws of the Bretts and Scots (q.v.). Erse is an early Scottish variant of the word "Irish" (OEng. *Irisc* or ONorse *Irskr*), for which the native name is Gaelic. Though the word is now nearly obsolete, it is still used by some writers as the ordinary designation of Irish alone.

ERSKINE, ĕrs′kin, DAVID STEWART, eleventh EARL OF BUCHAN (1742–1829). A Scottish author and antiquarian. He was educated at the University of Glasgow, after having received instruction in mathematics from Colin Maclaurin. In 1780 he founded the Society of Scottish Antiquaries. His agitation effected a reform in the election of Scottish representative peers. He wrote: *An Account of the Life, Writings, and Inventions of Napier of Merchiston* (with Dr. Walter Minto, 1787); *Essays on the Lives of Fletcher of Saltoun and the Poet Thomson* (1792); *Anonymous and Fugitive Essays* (1812).

ERSKINE, EBENEZER (1680–1754). A Scottish theologian, the founder of the Secession church in Scotland. He was the son of the Rev. Henry Erskine, minister of Chirnside in Berwickshire, and was born at Dryburgh, Berwickshire, June 22, 1680. He studied at Edinburgh, and, after acting for some time as tutor and chaplain in the family of the Earl of Rothes, he was licensed to preach the gospel by the presbytery of Kirkcaldy in 1703. In the same year he was appointed minister of Portmoak in the shire of Kinross. In 1731 he was transferred to Stirling, after having discharged the pastoral office in Portmoak for 28 years. Previous to this event, however, the religious peculiarities of Erskine had brought him into unpleasant relations with some of his brethren, by his defense of the *Marrow of Modern Divinity*, a book regarded as not strictly Calvinistic. Later he protested against the assumption of authority by the synod in the matter of assigning ministers and, along with three other clergymen, was deposed in 1733. (See PRESBYTERIANISM.) He was shortly after joined by his brother Ralph and several other ministers. They now virtually formed a distinct sect, but they still continued to occupy their parish churches. The synod in 1734 restored them to their legal connection with the church, but Erskine would not accept its action. In 1736 Erskine and his friends formally seceded, but still it was not till 1740 that they were ejected from their churches. Shortly after this, a quarrel broke out among the seceders in regard to the propriety of taking the civic oath required of burgesses of Edinburgh, Glasgow, and Perth. The result was a division of the sect into two bodies, the Burghers and Antiburghers. Erskine was the leader of the Burghers. He died in Stirling, June 2, 1754. His *Works* were published in 1785 and his *Life and Diary* in 1840, at Edinburgh. Consult his life by J. Ker (London, 1881).

ERSKINE, JOHN (OF DUN) (1509–91). A Scottish reformer, of a noble family, which lost several members at Flodden Field. He was educated at King's College, Aberdeen, and then abroad, after accidentally killing a priest. He brought the study of Greek into Scotland and was one of the first followers of Knox, his signature being affixed to the first covenant of the Scottish reformers. He was one of the commissioners sent to France to attend the marriage of Queen Mary and acted as mediator between Knox and the Queen in their famous quarrel. In 1578 he helped compile *The Second Book of Discipline*.

ERSKINE, JOHN, eighteenth LORD ERSKINE and eleventh EARL OF MAR (1675–1732). A Scottish politician. He was born at Alloa and in 1705 became Secretary for Scotland. He was a commissioner for the Union and in 1713 English Secretary of State. He became one of the principal leaders of the Jacobite party, and in 1715 was commander in chief of the Pretender's forces in Scotland. He had to retreat after the battle of Sheriffmuir, on Nov. 13, 1715, and accompanied the Pretender to Saint-Germain, where he engaged in all sorts of intrigues, and severed his connection with the Stuarts in 1724. He was unscrupulous and corrupt, and utterly devoid of principle in politics; but he is said to have been a man of ability and to have suggested several important municipal improvements for Edinburgh.

ERSKINE, JOHN (of Carnock, and afterward of Cardross) (1695–1768). An eminent Scottish jurist and professor of Scots law in the University of Edinburgh. He was the son of the Hon. John Erskine, of Carnock. John Erskine, the father, was a man of importance in his day, not only on account of the family to which he belonged, which even then had been prolific in historical characters, but in consequence of his personal qualities and the positions which he held. Having been forced to quit Scotland from his attachment to the Presbyterian religion, he retired to Holland and became an officer in the service of the Prince of Orange. At the Revolution he accompanied William to England, and as a reward for his services was appointed Lieutenant Governor of Stirling Castle and lieutenant colonel of a regiment of foot. John Erskine, the younger, born 1695, became a member of the Faculty of Advocates in 1719, but did not succeed as a practitioner of the law. On the death of Alexander Bain, in 1737, Erskine was nominated to succeed him in the chair of Scots law, an office the duties of which he performed with great reputation for 28 years. In 1754 he published his well-known *Principles of the Law of Scotland*, which, like the Commentaries of Blackstone in England and America, became the favorite textbook for many successive generations of law students. On his retirement from the professorship in 1765, Erskine occupied himself in preparing his more important work, *The Institutes of the Laws of Scotland*, but it was not published till 1773, five years after his death. As a legal writer, Erskine is inferior to none of the Scottish jurists, with the single exception of Lord Stair, who had the benefit of the more learned and wider judicial training of earlier lawyers who were educated in a continental school. But of all those departments which constitute the law of Scotland, as developed by the usages and forms of society in the country itself, there is at the present day no clearer, sounder, or more trustworthy expositor than Erskine.

ERSKINE, JOHN (1721–1803). A Scottish theologian, son of John Erskine, of Carnock; he was born in Edinburgh, June 2, 1721, studied at the University of Edinburgh, and in 1743 was licensed to preach by the presbytery of Dunblane. In the following year he was ordained minister of Kirkintilloch, near Glasgow, where he remained until 1753, when he was presented to the parish of Culross in the presbytery of Dunfermline. In 1758 he was transferred to New Greyfriars Church, Edinburgh, and in 1767 he was promoted to the collegiate charge of Old Greyfriars, where he had for his colleague Dr. Robertson. In the General Assembly of the Church of Scotland he was for many years the leader of the popular or evangelical party. He died in Edinburgh, Jan. 19, 1803. Erskine's writings are exceedingly numerous. They consist mostly of sermons and theological pamphlets, and exhibit a superior degree of ability. For his life, consult Wellwood (Edinburgh, 1818).

ERSKINE, JOHN (1746–1817). A Scottish lawyer. He was born in England and was a brother of Thomas, Lord Erskine. He was a Whig in politics and was appointed Lord Advocate of Scotland in 1783 and again in 1806. His fame rests chiefly on his wit and eloquence as an advocate at the Scottish bar.

ERSKINE, JOHN (1879–). An American university professor of English, born in New York City. He graduated from Columbia University in 1900 (A.M., 1901; Ph.D., 1903), where he became associate professor of English in 1909. He had previously served as instructor in English (1903–06) and associate professor (1906–09) at Amherst College. Besides numerous magazine contributions in prose and verse, he published: *The Elizabethan Lyric* (1903); *Selections from The Faerie Queene* (1905); *Actæon and Other Poems* (1907); *Leading American Novelists* (1910); *Written English,* with Helen Erskine (1910; rev. ed., 1913); *Selections from the Idylls of the King* (1912); *The Kinds of Poetry* (1913); *Poems of Wordsworth, Shelley, and Keats,* with W. P. Trent (1914); and he contributed to the second edition of the NEW INTERNATIONAL ENCYCLOPÆDIA.

ERSKINE, RALPH (1685–1752). A Scottish clergyman. He was born at Monilaws in Northumberland, studied at the University of Edinburgh, was licensed to preach in 1709, and became pastor at Dunfermline, in 1711, of the United Free Church in Queen Anne Street. He sympathized with the sentiments of his brother, Ebenezer Erskine (q.v.), who founded the Scottish Secession church, and in 1737 formally withdrew from the Church of Scotland. Like his brother, he was a most popular preacher. His *Gospel Sonnets* (1732; 25th ed., 1795) show Watts's influence and his poem *Smoking Spiritualized* is a quaint conceit. Consult his *Life and Diary* (Edinburgh, 1842) by Fraser.

ERSKINE, THOMAS, LORD (1750–1823). An eminent English advocate. He was born in Edinburgh, Jan. 21, 1750, the youngest son of Henry David, the tenth Earl of Buchan. His early education was meagre, though he attended classes at St. Andrews University during 1762 and 1763. At the age of 14 he entered the navy as midshipman and served for several years in the West Indies. Returning to England soon after the death of his father, he gave up the navy for the army.

Although he had been promoted to a lieutenancy, he was led by a chance conversation with Lord Mansfield to make a second change in his profession—to give up the army for the bar. He sold his commission in 1775, entered Lincoln's Inn, became a student in the chambers of Buller (afterward Mr. Justice Buller), matriculated as a gentleman commoner in Trinity College, Cambridge, and was called to the bar in 1778. During this period of study he was very poor; and he declares that he was spurred to the eloquence which gained for him instant fame, in his first case, by the thought that his children were plucking at his gown, crying to him that now was the time to get them bread. Not only did his remarkable address "entrance the judges and the audience," but it brought him many retainers and opened to him a lucrative practice. In 1779 he received from Admiral Keppel, whose acquittal upon court-martial he had secured, a £1000 fee. Five years later his annual income had increased to £3000, and it is said that he made while at the bar £150,000. He was not a great lawyer, but his unfailing courtesy, good humor, high spirits, and great eloquence placed him at the head of the English bar. His most remarkable successes as an advocate were gained in a series of litigations connected with the law of libel and treason. His defense of the dean of St. Asaph led to the passing of Fox's Libel Act in 1792, which affirmed the doctrine for which Erskine had contended, that the question whether a particular publication is libelous or not is for the jury and not for the court. By his successful defense of Walker, Hardy, Horne Tooke, and others, he exploded the theory of constructive treason upon which the prosecutions of these persons were based, and rendered invaluable service to the cause of personal liberty. In all these cases, as well as in his defense of Paine on the occasion of the publication of *The Rights of Man,* he displayed great moral courage and a lofty conception of professional duty.

Erskine entered Parliament in 1783, but his career both in the House of Commons and in the House of Lords was in striking contrast with that at the bar. His maiden speech was a failure owing to his fear of Pitt. On other occasions he actually broke down, and he was never able to address Parliament with the eloquence and power which characterized his forensic efforts. In 1806 he was made Lord Chancellor and elevated to a peerage with the title of Baron Erskine of Restormel. His reputation was not enhanced by his labors in this office, and after his retirement from the chancellorship, when the Whigs went out of office in 1807, he sank into comparative insignificance and poverty. Dying in 1823, he left his second wife and young child in straitened circumstances. Consult Campbell, *Lives of the Chancellors* (London, 1868), and High, *Speeches of Lord Erskine* (Chicago, 1876).

ERSKINE, THOMAS, of Linlathen (1788–1870). A Scottish writer on theology. He was born at Edinburgh, studied law at Edinburgh University, and practiced from 1810 until 1816, when he devoted himself to literary work. His theological views, particularly on "universal restoration" and the Atonement, were not orthodox; but his earnestness won them favor, and John McLeod Campbell (q.v.) and Frederic Denison Maurice (q.v.) were much indebted to them. The public advocacy of them led to Campbell's expulsion from the Kirk in 1831. Erskine's principal writings are: *Remarks on the Internal Evidence of the Truth of Revealed Religion* (1820; 10th ed., 1878); *The Unconditional Freeness of the Gospel* (1828; new ed., 1873); *The Doctrine of Election* (1837; 2d ed., 1878); *Spiritual Order and Other Papers* (1871). His works were translated into French, and he had many friends in France. Consult his *Letters* (1877), ed. by William Hanna, with contributions by Principal J. C. Shairp and Dean Stanley.

ERULI. See HERULI.

ERUPTIVE ROCKS. See IGNEOUS ROCKS.

ERWIN VON STEINBACH, ĕr′vĕn fōn stīn′bäG. The name of two German architects, father and son, born in Steinbach, and successively occupied in the construction of a new façade for the cathedral of Strassburg between 1277 and 1339. Neither the dates of birth and death nor the precise work accomplished by either can be accurately stated; but the greater part of the façade was probably completed by 1339. The great northwest spire was not built till a century later. The name Erwin von Steinbach, by which both are generally known, was not used before the seventeenth century. In 1845 a memorial monument was erected at Steinbach.

ERXLEBEN, ĕrks′lā-ben, JOHANN CHRISTIAN (1744–77). A German physician and naturalist. He was born at Quedlinburg and was a son of the highly gifted Dorothea Christine Erxleben, the first woman who obtained the degree of M.D. in Germany. He was educated at Göttingen, where he occupied the chair of natural philosophy from 1771 until his death. His principal works are the textbooks *Anfangsgründe der Naturgeschichte* (4th ed., 1791) and *Anfangsgründe der Naturlehre* (8th ed., 1794).

ER′YCI′NA (Lat., relating to Eryx, from *Eryx*, Gk. Ἔρυξ, a mountain in Sicily). A name of Aphrodite, derived from that of Mount Eryx.

ER′YMAN′THUS (Lat., from Gk. Ἐρύμανθος, *Erymanthos*). The ancient name of a mountain chain in the extreme northwest corner of Arcadia, now called Olonos. The highest peak is 7300 feet. A small river, also called anciently Erymanthus (at present Douana), rises in the mountains and eventually joins the Alpheus on the borders of Elis. This region was the scene of the famous struggle of Hercules with the Erymanthian boar. Being ordered to bring the animal to Mycenæ alive, Hercules chased it into the deep snow and, having thus tired it out, caught it in a noose.

ERYNGO, ē-rĭn′gō (Lat. *eryngion*, *eryngе*, Gk. ἠρύγγιον, *ērynglon*, ἠρύγγη, *ēryngē*, eryngo), *Eryngium*. A genus of umbelliferous plants, which have simple umbels, resembling the heads of some composite flowers. The species number about 150 and are mostly natives of the warmer temperate parts of the world, with alternate simple or divided leaves, which have marginal spines. One species, the sea eryngo or sea holly (*Eryngium maritimum*), which is common in the British Isles and is frequent on sandy seashores, is a very stiff, rigid, and glaucous plant. *Eryngium campestre* has also been found in England and Ireland, but is very rare. Its root was formerly much employed in some parts of Europe as a tonic. The root of *Eryngium maritimum* is used in the same way, possesses the same properties, and is sweet and aromatic. It is sold in a candied state and was formerly reputed to be a stimulant, restorative, and aphrodisiac. Eryngo root has also been used as an aperient and diuretic. Linnæus recommends the blanched shoots of *Eryngium maritimum* as a substitute for asparagus. *Eryngium fœtidum*, a native of the warm parts of America, is called fitweed in the West Indies, a decoction of it being much used as a remedy in hysterical cases. *Eryngium yuccifolium*, a native of low, wet places in North and South America, is called rattlesnake master and button snakeroot. The root is said to be diaphoretic and expectorant and has a spurious reputation as a cure for the bite of a rattlesnake. A number of species are cultivated as ornamentals on account of their curious habit of growth and the steel-blue color of their stems and bracts.

ER′YON (Neo-Lat., from Gk. ἐρύων, pres. part. of ἐρύειν, *eryein*, to draw out). A fossil macruran crustacean found in the Mesozoic rocks of Europe. The quadrate carapace is thin and flat, with deeply denticulate lateral margins, a straight or dented front margin, and a broadly truncated posterior margin. The thoracic legs are slender and bear pincers, the first pair being much longer than the others. The abdomen is shorter than the carapace, and the caudal swimming plates are small. About six species are known, ranging from the Liassic of England, through the Jurassic, into the Lower Cretaceous of Silesia. The best-known species is *Eryon propinquus*, with a body 5 inches long, of which finely preserved specimens have been found in the Jurassic lithographic limestones of Solenhofen, Bavaria. Eryon has a modern ally in the blind genus *Willemœsia*, which inhabits the deepest portions of the ocean. For illustration, see Plate of CRUSTACEA, FOSSIL.

ERYSICHTHON, ĕr′ĭ-sĭk′thŏn (Lat., from Gk. Ἐρυσίχθων, earth render). Son of the Thessalian King Triopas, punished by Demeter with unappeasable hunger because he cut down trees in a grove sacred to the goddess. He finally devoured his own limbs and died. His daughter Mnestra, who had received from Poseidon the gift of transforming herself into different shapes, was repeatedly sold by her father under the forms of a bird, a cow, and a horse, and each time returned to him.

ERYS′IMUM (Lat., from Gk. ἐρύσιμον, *erysimon*, hedge mustard). A genus of plants of the family Cruciferæ, with four-sided seed pods. *Erysimum cheiranthoides*, wormseed mustard, a branching annual, about 18 inches high, with small yellow flowers, is found in many parts of Europe and also in North America. It is not uncommon in waste places and cultivated grounds in the British Isles, but may perhaps have been originally introduced for its medicinal use. Its seeds were formerly much employed as an anthelmintic, from which it has the name of wormseed. It is also called treacle mustard, because it was employed as an ingredient in the famous Venice treacle. *Erysimum perfoliatum*, or *Conryngia orientalis*, hare's-ear mustard, is cultivated in Japan for the fixed oils contained in its seed. This plant has been introduced into parts of Canada and the United States, where it threatens to become a troublesome weed. Some of the plants formerly referred to as *Erysimum* are now included in other genera, as *Sisymbrium* and *Alliaria* (q.v.).

ER'YSIP'ELAS (Lat., from Gk. *ἐρυσίπελας*, from *ἐρυσι-*, *erysi-*, variant of *ἐρυθρός*, *erythros*, red, Lat. *ruber*, *rufus*, Eng. *red*, Ger. *rot*, Ir. *ruad*, OChurch Slav. *rŭdrŭ*, Skt. *rudhira*, red + *πέλλη*, *pellē*, skin, Lat. *pellis*, Eng. *fell*, Ger. *Fell*, Lith. *plèvė*, skin), or Saint Anthony's Fire. An inflammatory disease of the skin and subcutaneous tissues, attended by diffused redness and swelling of the part affected, and in the end either by desquamation or by vesication of the cuticle, or scarf skin, in the milder forms, and by suppuration of the deeper parts in the severer varieties of the disease (phlegmonous erysipelas). Erysipelas affects, in a large proportion of instances, the face and head; it is apt to be attended with a high fever and often with delirium and meningitis. Severe or phlegmonous erysipelas is apt to be succeeded by protracted and exhausting suppurations, and sometimes by diseases of the bones or inflammations of the internal organs. Erysipelas is frequently an epidemic disease in surgical hospitals, especially on the field of battle. (See Epidemic.) It is dangerously infectious. The treatment is supportive—tonics, such as iron, strychnine, and quinine; antiseptic dressings, and occasionally incisions in deep erysipelas with tension or suppuration. Specific vaccines have proved valuable aids in the cure. The *Streptococcus erysipelatis*, identical with *Streptococcus pyogenes*, is the causative germ. The presence of the bacteria in the subcutaneous tissues causes redness of the overlying skin and more or less infiltration of the tissues with serum, or with serum and pus. See Ichthyol; Anthony, Saint, Fire of.

ER'YSIPHA'CEÆ. The family of mildews. See Mildew.

ER'YTHE'MA (Neo-Lat., from Gk. *ἐρύθημα*, redness, from *ἐρυθαίνειν*, *erythainein*, to redden, from *ἐρυθρός*, *erythros*, red). A term which has been loosely applied to many different diseases. In its correct usage it denotes not a disease, but a symptom, viz., a local congestion (or hyperæmia) accompanied with superficial redness, which disappears under slight pressure. (Whitehouse.) Simple erythema consists of patches of rose, scarlet, or deep-purplish red, in spots, rings, or irregular patterns, or in areas with faint margins. There are heat and tingling, rarely tenderness. Heat, cold, friction, and pressure, bites and stings, irritant substances and chemicals, comprise the external causes; while rheumatism, drugs, toxin produced during fever or indigestion, and reflex nerve action are the principal internal causes. In inflammatory erythema there is an exudation, with elevation of the red surface and sometimes an extravasation of blood. (See Chilblain; Frostbite.) There may be papules, vesicles, or irregular markings, nodules or blood blisters (*erythema exudativum multiforme*, Hebra). There may be fever, gastric symptoms, coated tongue, followed by pain and swelling about the joints, especially in the lower extremities, with the formation of nodes along the shins and tops (dorsa) of the feet; this constituting *erythema nodosum*. *Erythema venenatum* is a form due to exposure to poisonous plants. *Erythema solare* is another term for sunburn. Regulation of digestion, diuretics, alkaline solutions, oil inunctions, and protective powders or ichthyol are useful in the treatment in conjunction with the removal of the immediate cause, where this can be determined.

ERYTH'IA. One of the Hesperides (q.v.).

ERYTHRÆ'A. See Centaury.

ERYTHRÆA. See Eritrea.

ER'YTHRÆ'AN SEA (Lat. *Mare Erythræum*, Gk. *ἡ ἐρυθρὰ θάλασσα*, the red sea). In ancient geography, a name applied to an expanse of the Indian Ocean, including the Arabian Sea and Persian Gulf. Later geographers restricted the name to the Arabian Sea.

ER'YTHRITE. A hydrous arsenate of cobalt occurring in monoclinic prisms, in drusy, incrustating forms and in earthy pink crusts upon other cobalt minerals. It is usually crimson red to peach red in color, from whence it derives the common name of *cobalt bloom*. Erythrite occurs in Saxony, Baden, Norway, and in Pennsylvania, Nevada, and California. It has recently been found at Cobalt, Canada.

ER'YTHRO'NIUM (Neo-Lat., from Gk. *ἐρυθρόνιον*, *erythronion*, the name of some plant, from *ἐρυθρός*, *erythros*, red), Dog's-Tooth Violet, or Adder's-Tongue. A genus of bulbous-rooted plants of the family Liliaceæ, found in the light, rich soil of cool, moist, but not densely shaded woods of the north temperate zone. Nine species with numerous well-marked varieties are indigenous in British Columbia, Washington, and Oregon; one in the Rocky Mountains from Colorado to California; four in eastern North America, and four in the Old World. In early spring two radical leaves, often handsomely mottled, appear; between them is a naked scape bearing one or several flowers with more or less reflexed petals, whose colors range in some species through various shades of yellow to white, in others from greenish to lavender and reddish tints. *Erythronium grandiflorum* (for illustration, see Plate of California Flora and Plate of Monocotyledons), one of the Pacific coast species, has unmottled leaves, produces 1–5 very bright yellow flowers on each scape. *Erythronium americanum*, of which there are several varieties, is the commonest species east of the Mississippi. (For illustration, see Plate of Liliaceæ.) The name "adder's-tongue" is also applied to the fern *Ophioglossum vulgatum*.

ERYTH'ROPHYLL (from Gk. *ἐρυθρός*, *erythros*, red + *φύλλον*, *phyllon*, leaf). A name formerly applied to the red pigments appearing in leaves in autumn. See Anthocyan; Color in Plants.

ERYTHROSIN. See Coal-Tar Colors.

ER'YTHROX'YLON. See Coca.

E'RYX (Lat., from Gk. *Ἔρυξ*). An ancient city and mountain in the western part of Sicily. The mountain is now known as Monte San Giuliano. The summit was occupied by a famous shrine of Venus Erycina. During the first Punic War it was held by Hamilcar Barca.

ERZBERG, ĕrts'bĕrk. See Eisenerz.

ERZERUM, ĕr'z'-rōōm', or **ERZEROUM.** The capital of the vilayet of the same name in Turkish Armenia, situated on a plain 6000 feet above the sea level (Map: Turkey in Asia, D 2). There are a number of mosques, baths, and mausoleums. Its fortifications have been renewed since 1864. Erzerum is famous for its copper and iron ware as well as for its shawls and carpets. The industries, however, have declined considerably on account of emigration and the turbulent state of the country. Its commerce, which was mostly with Persia, has diminished since the completion of the Transcaucasian Railway, over which route the trade between Persia and Europe is mainly carried. The population is variously estimated at from 43,000 to 80,000, half of whom are Turks, the rest being Armenians, Persians, and Greeks. It is the seat of several consular representatives.

Erzerum is an ancient town. Its Armenian name was Garin Khalakh. Near it stood the old Syro-Armenian town of Arsen. When the Seljuks captured this place, the inhabitants fled to a fortress at Erzerum, which the Seljuks accordingly called Arsen-er-Rum, i.e., Arsen of the Romans (or Byzantines), whence the modern Erzerum. In 1201 it fell into the hands of the Seljuks; of the Mongols in 1242; and finally, in 1517, into those of the Turks. In the War of 1828–29, between the Turks and the Russians, the taking of Erzerum by the latter decided the campaign in Asia. Erzerum was an important military centre during the War of 1877–78 and held out against the Russians, who were allowed to occupy it at the close of the war. In October, 1878, it was returned to the Turks.

ERZGEBIRGE, ĕrts′ge-bẽr′ge (Ger., Ore Mountains). A mountain range of Europe, extending along the boundary line between Saxony and Bohemia (Map: Germany, E 3). It stretches southwest and northeast for a distance of about 100 miles, from the Elster Mountains on the southwest to the Elbsandstein Mountains on the northeast. It has a breadth of about 25 miles and rises abruptly on the south side, while the north side slopes gradually and contains many well-cultivated and fertile valleys. The highest peak, the Keilberg, is 4060 feet high, while the average elevation is about 2500 feet. The Elbe receives the drainage from both sides of the watershed—on the south through the Eger, and on the north chiefly through the Mulde. The range is crossed by numerous passes and railway lines. The forests are very extensive and the climate is somewhat rigorous. The summer air is, however, invigorating, and many resorts, such as Kipsdorf and Bärenfels, are found among the mountains. The main central mass is gneiss, with mica schist on the northern slope, but with some crops of eruptive rocks. The mineral deposits from which the range takes its name are of great importance. Silver was found in the Erzgebirge as early as the twelfth century, and lead, copper, tin, iron, nickel, and cobalt have been mined for a long time. Large deposits of coal are also found, and the industrial importance of Saxony and Bohemia is due to a large extent to the mineral wealth of the Erzgebirge.

ERZINGAN, ĕr′zĭng-*an*. The capital of a sanjak in the Vilayet of Erzerum, Asiatic Turkey, on the Sivas-Erzerum road, 86 miles southeast of Erzerum (Map: Turkey in Asia, D 2). It is 3900 feet above sea level, on the western fringe of a fertile plain watered by the western Euphrates. It is an important garrison town, and its chief features are the modern government buildings, extensive barracks, and military hospital. There are also a fine mosque, a good bazaar, an Armenian teachers' seminary, and Armenian schools for juveniles. With the exception of the main thoroughfare, the streets are narrow and dirty. There are manufactures of silk, cotton, canvas, and copper ware, and in the vicinity are government tanneries and clothing factories. Agriculture is well developed, cereals and fruit being largely grown on the surrounding plains. The Arsinga of mediæval times, it was a place of importance as early as the fourth century. There are now, however, few traces of its antiquities. It was almost totally destroyed by an earthquake in 1784. Pop., about 18,000, of whom about one-half are Mohammedans and the rest Armenian Christians.

E′SARHAD′DON (Assyr. *Asur-ah-iddina*, Asur has given a brother). A King of Assyria who succeeded his father, Sennacherib, and reigned 681–668 B.C. He had been placed over Babylonia during his father's lifetime and by a special decree had been declared heir to the throne. In consequence perhaps of this favoritism shown to a son who was not the eldest, Sennacherib was murdered by two of his sons, Sharezer and Adarmalik (2 Kings xix. 36–37). The Babylonian chronicle, however, makes mention of only one son as the assassin. Proclaiming himself Governor of Babylonia, Esarhaddon set out in hot haste to avenge his father's death. The war, which is noted in the Babylonian chronicle as an interregnum, lasted less than a year, and at the end of that time Esarhaddon was able to declare himself King of Assyria. His reign was full of military campaigns. He conducted successful operations against the Chaldæans. In the west Sidon was captured and razed to the ground. Tyre he tried to take, but failed. His most important enterprise was an attack upon Egypt. In two campaigns (673 and 670 B.C.) Egypt was taken and reorganized under Assyrian rule. It was Esarhaddon's misfortune that during his time began the series of attacks from the north which finally ended in the fall of Assyria, but he did all he could to check them. In 668 Egypt rebelled, and he set out to chastise the rebels, but died on the way. He showed a great predilection for Babylon, and, granting the people as much independence as was consistent with the recognition of Assyrian supremacy, he planned the rebuilding of the city, which had been destroyed by Sennacherib in 689, and restored it to its former glory. By his wish Samas-sum-ukin was made Governor of Babylonia and Asurbanipal King of Assyria. Despite his numerous wars, he found time for elaborate building enterprises. He is regarded as one of the noblest of the Assyrian kings. See ASSYRIA.

ESAU (Heb. *Esau*, hairy). According to Gen. xxv. 24 ff., the elder son of Isaac and twin brother of Jacob. The rivalry of the two brothers began when they were still in the womb (Gen. xxv. 22). When Esau grew up, he became a "man of the field," as opposed to Jacob, who "dwelt in tents" (Gen. xxv. 27). As the elder son, he was entitled to precedence over Jacob, but sold his birthright to his brother (Gen. xxv. 29, 34). In spite of this he attempted to secure Isaac's dying blessing, which pertained to the birthright; but Jacob circumvented him, and Esau received only a secondary blessing (Gen. xxxvii. 1–40). Esau, now greatly enraged, resolved to kill his brother, and Jacob fled to escape him (Gen. xxxvii. 41, 45); but on Jacob's return from sojourning with Laban, 20 years after, Esau became reconciled to him (Gen. xxxiii. 1–15), and the two brothers later buried their father together (Gen. xxxv. 29).

This narrative is regarded by many scholars as reflecting the history of the Edomites, represented by Esau, and the Israelites, represented by Jacob. This is indeed suggested by the oracle: "Two nations are in thy womb, and two peoples shall part from thy bowels; and the one people shall be stronger than the other people, and the elder shall serve the younger" (Gen. xxv. 23). As a nation, Edom was older than Israel, having had a succession of kings before there was a union of the tribes and a kingdom in Israel (Gen. xxxvi. 31 ff.). But Edom was conquered by David and continued for some time to be subject to the dynasty he founded. The story reveals a certain admiration for the qualities of the kindred people, but also an unmistakable pride in the cleverness with which a richer blessing, i.e., greater prosperity and power, was won by Israel. There is no explicit or implied criticism of Jacob's cunning and deceit; it was the manifest destiny of Israel to become the ruler, and Edom would have to be satisfied with its lot. Israel had been foreordained to enjoy the luxuries of its rich land and to hold power over the older nation; let Edom hunt for a living among its mountains; but let both peoples be mindful of their common origin. In the judgment of many interpreters to-day, neither the poetic oracles nor the prose story can have been written before the reign of David, or after the reëstablishment of Edomitish independence. Those who follow the current system of Pentateuchal analysis assume that in the narrative two versions—one Judæan, the other Ephraimitish—have been interwoven, and that the former shows more sympathy with Edom and a veiled criticism of the northern kingdom, Israel. But the analysis has been seriously questioned by independent scholars (see PENTATEUCH), and there seems to be no clear sign of any such criticism. There is nothing that necessitates a later date than the time of Solomon. See EDOM, and consult Schmidt, *Messages of the Poets* (New York, 1911), and Gunkel, *Genesis* (3d ed., Göttingen, 1912).

ESBJERG, ĕs'byĕrg. A seaport of Denmark, situated on the North Sea, opposite the island of Fanö, and 35 miles west of Kolding (Map: Denmark, B 3). The town has considerable manufacturing and fishing and is an export centre for dairy products, bacon, beef, and cattle. It has steamship traffic with England and is the terminus of a submarine cable to Calais. Pop., 1890, 4111; 1901, 13,355; 1911, 18,208.

ESCALANTE, äs'kȧ-län'tȧ, JUAN (?–1519). A Spanish soldier and explorer. He went to Mexico with Hernan Cortés, by whom he was appointed high constable of Villa Rica de Vera Cruz, founded by Cortés at the place where he landed. At the order of his chief Escalante destroyed the Spanish fleet of 10 vessels and remained on guard at the new settlement with 150 men while Cortés marched to the interior. Because of the assassination of two of his men by hostile tribes Escalante with 50 of his men and several thousand Indian allies attacked the offending natives, but, though the Spaniards won the batle, he and seven of his men were killed.

ES'CALA'TOR. A form of mechanical elevator for passengers or freight, in which the lift is in a direction inclined from the vertical. It resembles an endless band conveyor and is made up of slats or narrow platforms hinged to each other and carried by a pair of chains borne on revolving drums—one at the upper level and the other at the lower. The passenger steps upon the moving band of slats or treads at the bottom, moving horizontally as upon a moving sidewalk (see TRAVELING SIDEWALK); but in a few feet thereafter the incline begins, and each slat or tread remaining horizontal forms a tread as of a stairway, moving upward along the incline. At the top the treads pass into horizontal motion, close together, and the passenger steps off upon the stationary surface at the end or side or both. Hand rails permit the passenger to steady his body as the treads ascend. The passenger can ascend the flight of treads as a stairway and thus hasten his transit. See ELEVATOR.

ESCALLOP. See SCALLOP.

ESCAL'OP, or ESCALLOP (OF. *escalope*, from MDutch *schelpe*, shell, dialectic Ger. *Schelfe*, husk, Eng. *scalp*), or SHELL. A symbol used in heraldry to signify that the bearer has made many long voyages by sea. As an emblem of pilgrimage, it was commonly given to those who had been to the Crusades, and it came to be regarded as indicating either that the bearer or his ancestor had been a crusader. The escalop shell was the emblem of St. James; hence all those who made the pilgrimage to his shrine at Compostela were entitled to bear the escalop shells. See HERALDRY.

ESCANABA, ĕs'kȧ-nạ'bȧ. A city and the county seat of Delta Co., Mich., 73 miles south of Marquette, on the Chicago and Northwestern, the Minneapolis, St. Paul, and Sault Sainte Marie, and the Escanaba and Lake Superior railroads, and on Little Bay de Noquette, an inlet of Green Bay, Lake Michigan (Map: Michigan, C 3). Situated on a picturesque promontory and having excellent facilities for trout fishing and boating, Escanaba is a popular summer resort. It has a good harbor with a frontage of 8 miles, has regular steamboat connection with a number of lake ports, and is one of the most important shipping points for the Lake Superior iron region. There are eight iron-ore docks, handling more than 4,000,000 tons annually, and large merchandise docks, the trade in coal, fish, and lumber being extensive. The city contains railroad repair shops, an ore-crushing plant, furniture, flooring, and wooden-ware factories, and a tie-preserving plant. Noteworthy features include the public library, hospital, high school, city hall, county jail, and courthouse. Escanaba was settled in 1863, incorporated as a village in 1883, and first chartered as a city in the same year. Pop., 1900, 9549; 1910, 13,194; 1914 (U. S. est.), 14,747; 1920, 13,103.

ESCAPE (OF. *escaper*, *eschaper*, Fr. *échapper*, It. *scappare*, to escape; probably from ML. *ex capa*, out of a cloak or cape, from Lat. *ex*, out, and ML. *capa*, cape). In its broadest sense, the unauthorized liberation of a person from lawful custody, in any manner or for any time, however short. If the liberation is accomplished by the prisoner himself with force, it is called prison breaking, or *prison breach;* if it is effected by others with force, it is called *rescue*. An escape by the prisoner himself, if with force, is a felony, and, if without force, a misdemeanor, punishable by fine or imprisonment. Under modern statutes a prisoner who has made his escape and been recaptured loses the commutation of his sentence which he may have earned by previous good conduct. A person who aids a criminal in escaping, or in attempting to escape, is guilty, as a rule, of the same grade of crime and liable to the same punishment as the prisoner who escapes. This principle applies also to officers who voluntarily permit an escape. If the officer is negligent, simply, he is guilty of a misdemeanor. When a person is imprisoned under a final judgment in a civil action, his escape renders the sheriff, or officer having him in custody, liable to the plaintiff. Consult the authorities referred to under CRIMINAL LAW.

ESCAPE'MENT. That part of the machinery of a watch or clock by which the onward revolving motion produced by the moving power, whether weights or spring, is restrained by the time-measuring element, such as the pendulum or balance wheel. The latter allows one tooth of the last wheel in the train of gears to escape or pass the pallets of the escapement at each swing or oscillation. See CLOCK; WATCH.

ESCAPE WARRANT. A warrant authorized by English statutes of 1702 and 1706 for the better preventing of escapes from the Queen's Bench and Fleet prisons. At present it is employed but rarely. A new warrant is not necessary for the rearrest of an escaped prisoner; but the person from whose custody he escapes may pursue and retake him, and may, after notice of his errand and refusal of admittance, break open doors or windows in order to effect the recapture.

ESCARP, or **SCARP** (Fr. *escarpe*, It. *scarpa*, from Fr. *escarper*, It. *scarpare*, to cut steep). The side or slope of the ditch next to the parapet. When the ditch of a permanent fortification is dry, the escarp is usually faced with mason work, to render it difficult of ascent; and behind this facing, technically known as revetment (q.v.), there are often casemates (q.v.) for defense. See FORTIFICATION.

ESCARPMENT. See CLIFF.

ESCAUT, ā'skō'. The French name for the river Scheldt (q.v.).

ESCHAR, ĕs'kär (OF. *escare*, Lat. *eschara*, Gk. *ἐσχάρα*, *eschara*, scab). A slough or portion of dead or disorganized tissue. The name is commonly applied to artificial sloughs produced by the application of caustics (q.v.).

ESCHATOLOGY, ĕs'kȧ-tŏl'ō-jĭ (from Gk. *ἔσχατος*, *eschatos*, last + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The doctrine concerning man's existence after death, the future of nations, and the final condition of the world. Even on the lower stages of religious development speculation upon the things to come is not wholly limited to the fate of the individual. The shifting fortunes of war and the varying success in obtaining supplies give rise to anxious or hopeful thoughts of what may befall the tribe. Devastating floods, fires, cyclones, earthquakes, or volcanic eruptions, and terror-inspiring eclipses of the heavenly bodies suggest the possibility of a destruction of the world. But the higher forms of eschatological thought presuppose a more complex social organism and a closer observation of natural phenomena. It is especially myths of astrological origin that furnish material for highly developed eschatologies, and oppression by nations aspiring to world empire that supplies the impulse. Hope of deliverance from galling political servitude springs from a proud and outraged national consciousness, kept alive by the memory of past greatness, and dreams of empire are born of the example set by mighty conquerors and rulers holding nations in subjection. Only prolonged observation of the movements of the planets and the sun's course through the signs of the zodiac can render possible the thought of a reoccurrence at the end of the present period of the events connected with the world's origin, and a renovation of the world after its destruction. Along the different lines of eschatological speculation there is, therefore, a general development reflecting the growth of man's intellectual and moral perceptions, his larger social experience, and his expanding knowledge of nature. The outward forms, however, vary according to the character of the environment and the peculiar genius of each people, and are also influenced by the relative value accorded to the individual and to the nation or the world. It is seldom that an eschatological idea is found in any people that is without a parallel among other nations, but it is equally rare that the same idea occurs in exactly identical form in different systems of religious thought.

Belief in a survival of the spirit or double, conceived as a material substance, in connection with the dead body as its local habitation as long as food and drink are furnished, gives little opportunity for the imagination. As, with the advance of civilization, the great cosmic forces come into prominence as objects of worship, and the departed spirits are brought into connection with them, the life beyond grows richer; and as the peculiar tribal customs establish a standard of right and the effects of conformity are observed, the spirits themselves are made subject to the same laws of retribution, and a judgment after death is introduced. Through this twofold development the future life may thus be spiritualized and assume a moral character, as in ancient Egypt. But it is also possible for the old conception of a shadowy existence in the grave or a subterranean realm to retain its hold in the main, while a way out of it into larger life, with moral distinctions, is found in the thought of a restoration and reanimation of the old body, thus insuring personal identity, as in Persia and Judæa. Or the spirit may be conceived of as entering immediately upon death into another body, to live again and die and become reincarnated in ever new forms, as in India. This doctrine of metempsychosis renders it possible to introduce into the future life the nicest moral adjustments, implying at once punishments and rewards for conduct in a previous stage of existence and the possibility of rising or sinking in the scale of being according to present conduct. In spite of the perfect justice thus regarded as being administered on every stage of being, this never-ending series of births and deaths may come to appear as an evil, if the present life seems such, and deliverance may then be sought from the infinite wheel of existence in Nirvana. Still another possibility presents itself, when the functions of the mind are considered as indicating a purely spiritual essence independent of the body, having no beginning and no end, as in Greece. This abstract conception of immortality may be made the philosophical basis of a hope for a more concretely conceived personal life after death. For further details of this phase of eschatology, see IMMORTALITY.

The ideas held by different nations as to the future of the human race and the world are only imperfectly known to us. It would, of course, be quite wrong to suppose that such notions have been cherished only where we are fortunate enough to have testimony as to their existence, or that they have held a place in the life of nations proportionate to their prominence in such literary remains or other accounts as we may possess. But certain inferences can be drawn from the type of eschatological thought that comes to view. When the belief in a coming destruction of the world by a fire or a flood is found among uncivilized tribes in the Pacific, or American aborigines, it is not likely that it originated in astronomical speculation, but rather that it was engendered by some terrifying experience of the past. Though the medium through which the accounts have come makes them somewhat doubtful, it is not impossible that the Spaniards found in Central America the belief in the coming of a white conqueror. If so, the history of the great American civilizations had prepared men for the possibility of the overthrow even of an ancient kingdom, and this apprehension had been fused with the vague rumor of white men who had once settled in the New World. The notion of four great periods of the world, each lasting hundreds of years and ending in a universal conflagration, also presupposes a longer historic development. The remarkable stability of the Chinese Empire and the practical disposition of its people preclude the development of a flourishing eschatology. On the other hand, the brooding genius of India cares little for political independence and is too deeply impressed with the infinite to have its attention absorbed by possible catastrophic changes in the world. There are no last things to claim enthusiastic interest in a pantheistic philosophy that sees in every form of life a manifestation of the divine. But the infinite stretches of divine sway are divided into periods; and these *kalpas*, or epochs, give an eschatological perspective. In the main, however, it is the future of the individual only that occupies the mind of Brahmin and Buddhist alike. Quite different was the attitude of the ancient Iranians. Those who adopted the teachings of Zarathustra seem early to have developed the simple notion of a coming destruction of the world by fire into the idea of a great moral ordeal. As an individual may prove the truth of his religion by undergoing an ordeal of fire, so at the end of the world the worshipers of the lord Mazda will be distinguished from all others by successfully enduring the ordeal of molten metal, and the good will then be recompensed. This conception is found in the Gathas, the earliest part of the Avestan literature. It is not certain that the idea of a resurrection from the dead goes back to the period represented by the Gathas. But Herodotus seems to have heard of such a Persian conception in the fifth century B.C., and Theopompus, the historian of Philip of Macedonia, described it as a Mazdayasnian doctrine in the fourth century B.C., in a work of which excerpts have been preserved by Diogenes Laërtius and Æneas of Gaza. Whether the resurrection was already at that time connected with the coming of the Saoshyant is uncertain. In the later Avesta it is distinctly the work of the Saoshyant to raise the dead. A final revelation of character, a brief period of punishment in a hell, and an ultimate restoration of all to blessedness, are here assumed. Characteristic of Mazdaism is the idea of a gradual evolution towards a rational and moral end, and of the preparation for this end by the work of the faithful. The world is conceived as lasting 12,000 years. The appearance of Zarathustra falls at the beginning of the last quarter, and at each of the following millenniums one of the three sons of Zarathustra is born, the last of these being Astvatereta, the "restorer of the bodies," or Saoshyant, "the savior." This savior has no political character. After the final conquest of the serpent, Azi Dahaka, the reign of immortality begins. During the period in which the native religion was suppressed and gradually crowded out of its home by Islam, the hope of the persecuted turned to the future, as the apocalyptic sketches in the Pahlavi literature show, and the return of the old King Kai Khosru was ardently desired. The Homeric poems and Hesiod show how the Greek mind occupied itself with the soul's future in the Elysian fields or the darker realms of Hades. Through the Orphic and Eleusinian cults this thought was deepened, and the Christian doctrines of heaven (q.v.) and hell (q.v.) are largely due to Greek speculation. That the future of nations and the world also played an important rôle in Greek thought is evident from the prophecies of the Sibyls. For while the original Sibylline Oracles have not been preserved, the references to them by Heraclitus and Plato reveal their character, and this is also indicated by the imitations in our present Sibylline Oracles. The same source betrays the eschatological thought of the Romans. Some details of Vergil's description of the golden age may indeed have been borrowed from our Pseudo-Sibyl, herself reminiscent of Isaiah; but it is quite likely that the conception itself goes back to a genuine Roman origin. An eschatological mood dominates the epoch ushered in by Alexander's conquests, and Græco-Roman thought is fused with Oriental speculation in the outlook upon the world's future as in other respects. In a similar manner the Scandinavian idea of a destruction of the earth by fire and its subsequent renovation under higher heavens, to be peopled by the descendants of Lif and Liftraser, as set forth in Völuspa, no doubt reflects a primitive Germanic conception. Even the twilight of the gods may have belonged to the original myth. But the picture has unquestionably been retouched by Christian hands.

Among the Semitic nations none has probably contributed more largely to the common stock of later eschatological material than the people of ancient Babylonia. Their creation myth and astrology, based on careful observations of the celestial bodies, furnished events to be expected and foretold when times and seasons might be looked for. Nevertheless, such of their literary remains as have been discovered and examined do not permit us to determine what the Babylonians themselves thought of the world's future. It is among peoples to some extent dependent upon their civilization that we find the Marduk-Tiamat myth transferred from the beginning to the end of the world, and the millennial periods of the world's course elaborated. In early Israel the "Day of Yahwe" was a day of battle deciding the fortunes of a people. If the masses looked forward to it as a day of deliverance and victory, men like Amos and Hosea, Isaiah and Micah, Zephaniah and Jeremiah, feared that, the moral conditions being what they were, the advance of Assyria would bring destruction, complete or well-nigh complete, to Israel and Judah. They were prophets of doom. To one of the greatest among them, Jeremiah, this solemn forecast of coming judgment was the criterion of true prophethood. In later times the books containing their oracles were interpolated with prophecies of coming prosperity, which neither reflect their moral attitude nor are in harmony with their historic circumstances. But they are themselves significant signs of the expansion of eschatological hopes. The establishment of the Achæmenian Empire aroused among the Jews expectations of a return from Babylon, the restoration of the temple, and improved social conditions, as Isa. xl–xlviii indicates. During the numerous insurrections that marked the beginning of the reign of Darius Hystaspis, Haggai and Zechariah fanned the hopes of Judæan independence under a descendant of the old Davidic house, the present Governor of Judæa, Zerubbabel (q.v.); and Jer. xxx–xxxi apparently shows that this hope still lived after the death of Zerubbabel and found new nourishment in the great conflict between Persia and Greece. Alexander's phenomenal career, widening the horizons of men, inspired in Judæa, as elsewhere, serious thoughts concerning the destiny of nations. But the strongest impulses to eschatological speculation were furnished by the religious persecution under Antiochus IV Epiphanes and the Maccabean revolt. The Book of Daniel, written 165 B.C., voices the hope that the kingdom of the world will be given to the saints of the Most High, i.e., the Jewish people. Its celestial representative, probably Michael, after the destruction of the beast representing the Greek kingdom, comes with the clouds and receives the empire of the world. There is no Messiah in this apocalypse. The first distinct appearance of this deliverer and king is in the Psalms of Solomon, written soon after the conquest of Palestine by Pompey, in 63 B.C. (See Messiah.) During the century that lay between the Maccabean uprising and the final loss of independence to the Romans, the eschatological hopes centred upon the Asmonæan princes, by whom the conquest of the world was expected, as many a psalm in the Psalter testifies. The longing for a descendant of the Davidic line who would break the Roman yoke, establish the empire of the Jews, and rule as a righteous king over the subject nations, grew strong enough in the first century of our era to cause the rebellion that in 70 A.D. led to the destruction of Jerusalem. When Jesus proclaimed the coming of the kingdom of heaven, it is natural therefore that, in spite of His disavowal, He should be understood by some to be a claimant to the kingship of the Jews. Attracted by His wonderful personality, from love of Him and faith in the prophetic word, His disciples were filled with the conviction that He would return as the Messiah upon the clouds of heaven. Apocalyptic writings, such as Fourth Ezra (see Esdras, Books of), Enoch xxxvii–lxxi (see Enoch, Books of), and the Jewish originals utilized and expanded in Matt. xxiv (Mark xiii, Luke xxi) and the Revelation of John, show that even in circles where the hopes of the future did not attach themselves to the personality of Jesus, the Messianic idea grew more and more transcendent. It is not probable, however, that the final judgment and the raising of the dead were ever conceived by an adherent of the Jewish faith as functions of the Messiah. While on many points the eschatological ideas of the early Church were far from being fixed, it seems to have been quite generally believed that the end of the world was approaching; that it would be heralded by angelic trumpet blasts and ushered in by the descent of Jesus as the Messiah from heaven to establish His kingdom; that the living saints would then be translated and the dead in Christ raised to reign with Him for 1000 years; and that after the final conflict with evil the last judgment would be held, the present world would be destroyed by fire, and there would be a new heaven and a new earth in which righteousness should dwell. As Christianity spread, through missionary activity or military conquests, the Kingdom of God was identified with the Church, the doctrine of the millennium was largely abandoned, and eschatology occupied itself chiefly with the future of the individual in heaven, purgatory, or hell. The great creeds of Christendom, however, affirmed the belief in a return of the Son of God to judge the quick and the dead, and a resurrection of the just and the unjust. There does not seem to be sufficient documentary evidence to support the general assumption that about the year 1000 A.D. there was a widespread belief in the impending end of the world. But the famous hymn,

> Dies iræ, dies illa
> Solvet sæclum in favilla,
> Teste David cum Sibylla,

leaves no doubt either as to the eschatological mood of mediæval Christianity or as regards the source whence it was nourished. And of this there is testimony in the numerous apocalypses that grew up. It is natural that the biblical language concerning the millennium in Rev. xx and the destruction of the world by fire in 2 Peter should have occupied many minds. The more radical religious movement of the Renaissance period was strongly impregnated with eschatological thought. In the Baptist and anti-Trinitarian churches ardent expectations of the establishment of the kingdom of heaven on earth went hand in hand with the rejection of sacramental magic, devil, and hell, and practical attempts at founding a new social order, with hopes for the ultimate restoration of all souls after a period of unconscious sleep or limited punishment. In the great Lutheran, Anglican, and Reformed churches the rejection of the doctrine of a purgatory and of the intercession of the Virgin and the saints fixed man's destiny irrevocably at death, and therefore tended to render the closing scenes of judgment and resurrection of less practical importance, to eliminate the premillennial coming of Christ, and to make the millennium the result of a long-continued development of Christian life. By an allegorical method of interpretation the natural import of biblical language was lost and scriptural support found for the new outlook upon the future. Since the days of the French Revolution and the career of Napoleon there have been repeated outbursts of eschatological enthusiasm. Where the reaction against allegorical interpretation has not led to the adoption of a historico-critical method, the belief that all biblical prophecies will be fulfilled has engendered an ingenious system of exegesis by which the things expected by the Jews of the Maccabean period or the early Christians to occur in their own lifetime are transferred to the interpreter's own immediate future, some starting point for the new cycle of fulfillments being arbitrarily chosen. Thus, an independent eschatological speculation not unlike that of old may flourish under cover of biblical authority, and keep alive the expectation of impending judgment upon sin and fundamental changes in man's life and the interpretation of history in the light of eternal purposes.

Islam adopted from Judaism and Christianity the doctrines of a coming judgment, a resurrection of the dead, and everlasting punishments and rewards. Later contact with Persian thought greatly enriched its eschatology. Especially important was the thought of a reincarnation of some great representative in the past of Allah or His prophets. Again and again the world of Islam has been stirred by the expectation of some Imam or Mahdi to reveal more fully the truth or to lead the faithful into a better social condition on earth. Iran and Africa have been most fertile in such movements.

In modern Judaism the return of Israel to its land, the coming of the Messiah, the resurrection of the dead, and everlasting retribution are still expected by the orthodox, while liberals look upon Israel's mission as connected with the regeneration of the human race, and hope for an immortal life independent of the resuscitation of the body.

The criterion of exact science is its capacity to predict future things. In this lies to a large extent the convincing force of astronomical theories through which our modern estimate of the universe has been chiefly formed. A science that unfailingly foretells future events furnishes a new eschatology by suggesting that the earth's life is but an episode in the never-beginning and never-ending course of nature, and that, barring accidents, this planet must one day end its separate existence in the arms of its celestial parent, the sun. History, in its widest sense, teaches that the future of the human race must grow out of its present life, and that the conditions of humanity, whatever new revolutions may come, are not to be affected by cataclysmic changes wrought from without, but by forces already operating within. By observation of present tendencies it seems to many thinkers possible to predict that warfare will cease; that arbitration will take its place as a means of settling international differences; that competition and monopoly, with the extremes of wealth and poverty to which they give rise, will yield to public administration of industry and commerce for the public good, or some form of coöperation involving a more equitable distribution of the bounties of nature and the products of common toil; that ignorance will be reduced by universal education fitting each individual for the highest service he can render to society; that disease and criminality will be stamped out by preventive and remedial measures; that the conflict between rival sects and religions will end in a fellowship no longer based upon creed or cultic performance, but upon a common interest in the pursuit of truth and righteousness; and that thus the chief blessings associated with the millennium will come, not through a radical change in man's nature wrought by supernatural power, but by a gradual amelioration of the race. Eschatological speculation of this character, already seen in Plato's *Republic* and Thomas More's *Utopia*, has taken a strong hold upon the present generation. In the effort to realize the eschatological dreams of human society as it ought to be by strengthening the movements of thought and life that tend in the right direction, compensation is found by many for the silence of science concerning a survival of the individual, while they are ready to welcome any light that may be shed upon the mystery of death. See HEAVEN; HELL; IMMORTALITY; INTERMEDIATE STATE; JUDGMENT, FINAL; MILLENNIUM.

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ESCHEAT (Fr. *échoir*, from Lat. *cadere*, to fall out or happen). An incident of feudal tenure of real property, whereby the course of descent from the tenant is obstructed, and the property falls back or reverts to the immediate lord of whom the fee is held. In the common-law system there is, in theory at least, no such thing as absolute ownership of real property. The most extensive estate which one can have, the fee simple, is regarded as a derivative or subordinate estate, held of a superior landlord, to whom in certain eventualities it will return. The fact that in process of time most, if not all, intermediate or mesne lords have been eliminated, and that lands are now held in subordination only to the state, or, in England, to the crown, does not vitally affect this principle. The claim of the state to take lands by escheat is still based upon the theory of a superior lordship or proprietorship, and the holder of land in fee simple is still properly described as a tenant. In order to complete the title acquired by escheat, it is necessary that the superior lord shall perform some act, such as entering and taking possession of the land or bringing an action at law for its recovery. The principle upon which he thus recovers the property is that, since none but those who are of the blood of the person last seised can inherit, and there are no persons of that blood in being and capable of inheriting, the land must result back to the lord of the fee, of whom it is held.

According to the law of England, escheat was either *propter defectum sanguinis*—i.e., because there were *no heirs* of the deceased tenant—or *propter delictum tenentis*—i.e., because the blood of the tenant was *attainted* or corrupted, so that those who were related to him as heirs could not inherit. Such corruption of blood occurred when the tenant was convicted of treason or felony. The rule applied to all felonies and frequently produced much hardship. This form of escheat was peculiar to English law. It is to be carefully distinguished from forfeiture of lands to the crown for treason or felony, which has prevailed in other countries besides England. When this latter penalty was enforced for the crime of treason, the offender forfeited all his lands absolutely to the crown; when it was enforced for any other felony, the forfeiture to the crown was of all the offender's estates for life absolutely, and of all his estates in fee simple for a year and a day, after which they escheated to his immediate lord. (See Forfeiture.) In English law escheat as a result of conviction of crime is now abrogated; and all forfeiture for crime, except in cases of outlawry, is abolished. (Statute 33 and 34 Vict., c. 23.) It is provided by the Constitution of the United States that "Congress shall have power to declare the punishment of treason; but no attainder of treason shall work corruption of blood, or forfeiture, except during the life of the person attainted." (Art. iii, § 3.) This indicates the policy which has molded the laws of the various States, so that escheat as the result of crime is practically unknown in this country.

Though the feudal system of land tenure existed only in its later and mitigated form in the United States, and though it has been expressly declared to be abolished in some of the States, it continues in many important respects to govern the real-property law and its incidents. By virtue of statutory provisions, generally found in the State constitutions, the title to the property of one who dies without heirs is still transferred to the State in which it is situated, and this transfer is still denominated an escheat. It is the general rule that a proceeding known as "inquest of office" must be instituted, and an office found in behalf of the State, in order to vest in it the title to a decedent's realty. But this is not required in some of the States. See Estate; Fee; Real Property; Tenure; and the authorities there referred to.

ESCHENBACH, ĕsh′en-bäG, Wolfram von. See Wolfram von Eschenbach.

ESCHENBURG, ĕsh′en-bo͞ork, Johann Joachim (1743–1820). A German literary critic and translator, born at Hamburg and educated at Leipzig and Göttingen. He became tutor in 1767, professor in 1777, and director in 1814 of the Collegium Carolinum in Brunswick. Besides publishing German translations of English writers, notably the first complete German translation of Shakespeare's plays, *Shakespeares theatralische Werke* (13 vols., 1775–82), he wrote, among many, the hymns "Dir trau' ich, Gott, und wanke nicht" and "Ich will dich noch im Tod erheben," and was author of: *Handbuch der klassischen Litteratur, Altertumskunde und Mythologie* (1783; 8th ed., 1837); *Entwurf einer Theorie und Litteratur der schönen Redekünste* (1783; 5th ed., 1836); *Beispielsammlung zur Theorie und Litteratur der schönen Wissenschaften* (8 vols., 1788–95); *Lehrbuch der Wissenschaftskunde* (1792; 3d ed., 1809); *Denkmäler altdeutscher Dichtkunst* (1799).

ESCHENMAYER, ĕsh′en-mī-ĕr, Karl August von (1768–1852). A German metaphysician. He was born at Neuenburg, and was professor of practical philosophy at the University of Tübingen from 1818 to 1836. He studied and taught philosophy from the standpoint of Schelling (q.v.), his mystical tendency expressing itself in the assertion that one must advance beyond philosophy into nonphilosophy, a realm where not "speculation, but faith," holds sway. He took a deep interest in animal magnetism. His feelings found expression in violent polemics against the theories of Hegel and Strauss and in fanciful dreams of the spirit world. Among his writings are: *Die Philosophie in ihrem Uebergange zur Nichtphilosophie* (1803); *Psychologie* (1817); *System der Moralphilosophie* (1818); *Religionsphilosophie* (1818–24); *Mysterien des innern Lebens* (1830); *Grundriss der Naturphilosophie* (1832); *Betrachtungen über den physischen Weltbau* (1852).

ESCHER, ĕsh′ĕr, Johann Heinrich Alfred (1819–82). A Swiss statesman, born at Zurich. He studied law in his native town and at Bonn, Berlin, and Paris. In 1844 he was elected member of the Grand Council of the Canton. Even at that early period his sentiments were decidedly liberal. In January, 1845, together with six others, who shared his opinions, he published the famous summons to the popular assembly in Unterstrass, demanding the expulsion of the Jesuits. He was elected to the Council of the Interior in 1845 and to the Council of Education in 1846. The reorganization of the schools in the Canton of Zurich was his chief work, and he succeeded in introducing modern methods into the system of secondary education. In December, 1847, he became President of the Grand Council, and the following year he was sent as a deputy to the Federal Diet. In December of the same year he became President of the newly elected Cantonal Administrative Council. His energies were directed to the promotion of education, but he also furthered railway enterprise and banking institutions in Switzerland. He was President of the National Council in 1849, Vice President of the Confederation in 1856–57 and 1861–62, and became subsequently several times President. He died Dec. 6, 1882, at Zurich, where a bronze statue has been raised to his memory. Consult Scherr, *Alfred Escher* (1883).

ESCHERICH, ĕsh′ĕr-ĭk, Karl Leopold (1871–). A German entomologist, born in Schwandorf and educated at Munich, Würzburg, Leipzig, and Heidelberg. From medicine he turned to zoölogy and traveled in Tunis (1892), Central Asia Minor (1895), Algeria (1898, 1902), Abyssinia (1906), Ceylon (1910), and North America (1911). In 1901–06 he was privatdocent at Strassburg, and in 1907 became professor in the Forestry Academy at Tharandt. He wrote: *System der Lepismatiden* (1905); *Die Ameise* (1906); *Ferienreise nach Erythrea* (1908); *Die Termiten oder weissen Ameisen* (1909) and *Termitenleben auf Ceylon*

(1910), singularly interesting and valuable studies; *Die angewandte Entomologie in der Vereinigten Staaten* (1913); *Die Forstinsekten Mitteleuropas*, vol. i (1913).

ESCHER VON DER LINTH, ĕsh'ĕr fōn dĕr lĕnt, Hans Konrad (1767–1823). A Swiss statesman, born at Zurich. After study at Göttingen (1786–88) and extensive travel, he was a member of the Legislative Assembly of the Helvetian Republic in 1798–1802. In 1798–1801 he edited the *Schweizerischer Republikaner*. In 1802 he withdrew from politics, and from 1807 to its completion in 1822, as president of the board of inspection, directed the improvement of the Linth, the upper course of the Limmat, by means of a canal. A large tract of land was thus reclaimed to useful purposes. Escher was regarded as a benefactor of the commonwealth, and the surname Von der Linth was officially granted to his family in 1823. Consult the biography (Zurich, 1852) by Hottinger.

ESCHRICHT, ĕsh'rĭkt, Daniel Frederik (1798–1863). A Danish physiologist and zoölogist. He was born at Copenhagen, studied medicine there, and after practicing as a physician for three years, took a supplementary course in physiology and comparative anatomy in Germany and France. He was professor at Copenhagen from 1836 until his death, when his valuable collection was acquired by the Zoölogical Museum. His investigations covered an extensive field. Among his principal publications are *Haandbog i Physiologie* (new ed., 1851) and *Folkelige Foredrag* (1855–59).

ESCHSCHOLTZ, ĕsh'shōlts, Johann Friedrich (1793–1831). A Russian naturalist and traveler. He was born at Dorpat, where he studied medicine. In 1815 he made a tour of the world with Otto von Kotzebue and Adelbert von Chamisso, collecting a great number of zoological specimens and making important scientific investigations. The results of this voyage were published in Kotzebue's *Entdeckungsreise in die Südsee und Beringstrasse* (1821), to which Eschscholtz contributed a number of valuable articles. After his return in 1819 he was appointed extraordinary professor of anatomy in Dorpat, and in 1823 he again accompanied Kotzebue on a voyage around the world. The extensive collection acquired during these tours was presented by Eschscholtz to the University of Dorpat in 1826. He later published a catalogue of the 2400 animals of this collection in vol. ii of Kotzebue's *Neue Reise um die Welt* (1830). A botanical species, *Eschscholtzia*, was named in his honor by Chamisso, and Eschscholtz Bay, an inlet of Kotzebue Sound, on the coast of Alaska, perpetuates his achievements as an explorer. His principal work is the *Zoologischer Atlas, enthaltend Abbildungen und Beschreibung neuer Tierarten* (5 parts, 1829–33).

ESCHSCHOLTZIA, ĕsh-shōlts'ĭ-á (Neo-Lat., named in honor of J. F. Eschscholtz, a Russian naturalist and traveler). A genus of plants of the family Papaveraceæ. *Eschscholtzia californica*, the California poppy, and other species, natives of California and Arizona, have now become very common in our flower gardens, making a showy appearance with their large deep-yellow flowers. This plant has a remarkable calyx, which, much resembling in its form the extinguisher of a candle, separates from the dilated apex of the flower stalk and is lifted and thrown off by the expanding flower. For illustration, see Plate of California Flora, and Plate of Poppy and Pepper Tree.

ESCHWEGE, ĕsh'vā-ge (mediæval *Eskeneweg*, *Eschinwanch*). A town of the Prussian Province of Hesse-Nassau, situated in a fertile valley of the Werra, 25 miles east-southeast of Cassel (Map: Prussia, D 3). It consists of an old and a new town, on the left and right banks of the river respectively, and a suburb on an island connected with the mainland by two stone bridges. The castle, erected about 1386, is now occupied by the district court. The so-called Black Tower is all that remains of the convent founded by Charlemagne. Eschwege is an important industrial centre. It has large tanneries, manufactures of woolen, cotton, and linen goods, haircloth, soap, cigars, brushes, shoes, and machines. It has large slaughterhouses and does a large business in pork and sausage. Pop., 1900, 11,117; 1910, 12,542.

ESCHWEILER, ĕsh'vī'lĕr. A town of the Prussian Rhine Province, on the Inde, about 8 miles northeast of Aix-la-Chapelle (Map: Prussia, B 3). It is the centre of a rich mining district, its coal mines being noted for their great depth and superior quality of product. Cadmium, zinc, copper, and lead are also mined, as they have been from the days of the Romans. The manufactures comprise boiler plate, iron pipe, wire, tin plate, wheels, boilers, machinery, miscellaneous articles of iron, copper, zinc, and lead, confections, belting and leather goods, bricks, malt and beer. Pop., 1900, 21,895; 1910, 24,718.

ESCLOT, Bernat. See Desclot.

ESCOBAR Y MENDOZA, ās'kō-bär' ē mĕn-dō'thá, Antonio (1589–1669). A Spanish Jesuit and casuist, born at Valladolid. He was accused of founding the doctrine that the moral value of actions lies in the nature of the intention; in other words, that purity of purpose may be justification for actions contrary to the moral code and contrary to human laws. His casuistry was severely criticized in the *Provincial Letters* of Pascal, and his doctrines were disapproved by many Catholics and gently censured by the authorities at Rome. Under the witty ridicule of such French writers as La Fontaine, Boileau, and Molière the name of Escobar, a priest of exemplary life, was used for coining the word *escobarderie*, a synonym for extreme laxity in moral principle. Among his writings are *Liber Theologiæ Moralis* (London, 1646) and *Summula Casuum Conscientiæ* (Pamplona, 1626).

ESCOBEDO, ās'kō-bā'dō, Mariano (1827–1902). A Mexican soldier, born at Dos Arroyos, Nuevo León. He was originally a muleteer, took part in the Mexican War, became prominent in the "War of the Reform," was in 1859 appointed a colonel by Juárez, and contributed largely to the success of the Republican cause. Upon the establishment in Mexico of the ill-fated Empire of Maximilian, he withdrew to San Antonio, Tex., organized a republican force made up of Mexican refugees, ex-Confederate soldiers, and negroes, and in 1865 captured the garrison of Monterey. In 1867 he utterly defeated Miramón at San Jacinto and was appointed commander in chief of the republican armies, with rank of general of division. On May 15 of that year he took Querétaro and captured the Emperor Maximilian. In 1875–76 he supported President Lerdo de Tejada against the revolution under General Diaz, served Lerdo as Minister of War, escaped to New York, and was afterward active in conspiracy against the Diaz government, but in 1882 accepted the office of president of the supreme military court of justice. He retired in 1884.

ESCOIQUIZ, ĕs'kō-ē-kēth', JUAN (1762–1820). A Spanish churchman, politician, and author, born in Navarra or at Bermeo in Biscaya—accounts vary. He became the instructor of the future King Ferdinand VII and gained an ascendancy over his pupil that lasted for many years. After the abdication of Charles IV (1808) Escoiquiz was made Counselor of State; he accompanied Ferdinand to Bayonne and saw him fall into the trap so skillfully set by Napoleon (1808). During the devastating War of the Peninsula he remained in France. Upon the return of the King to power he was made Minister, but soon fell into disgrace, and afterward was exiled to Ronda, where he died. He wrote *Idea sencilla de las razones que motivaron el viaje del rey Fernando VII á Bayona* (1814), which is an important historical document; and a translation of Young's *Night Thoughts* (1797) and of *Paradise Lost* (1813).

ESCOLAR' (Sp. scholar). A mackerel-like fish (*Ruvettu pretiosus*) of tropical parts of the Atlantic in deep water, and well known in the Mediterranean, where it is called by the Italians roveto or ruvetto. It is not much valued in Europe, but is highly regarded in the Antilles, and especially in Cuba, where the fishermen make a business of catching it between the disappearance of the spear fish and the coming of the red snappers. Its extreme oiliness and its rough skin have caused it to be called oilfish and scourfish along the Gulf coast. The term "escolar" is applied by ichthyologists to the whole family (Gemyplidæ) which this fish represents.

ESCORIAL, *Span. pron.* ĕs-kō-rĭ-äl' (Sp., from *escoria*, slag, from Lat. *scoria*, Gk. *σκωρία*, *skōria*, slag). A celebrated building in Spain (El real monasterio de San Lorenzo del Escorial), comprising a monastery, church, college, tomb, and palace. During the battle of San Quentin, won by the Spaniards on St. Lawrence's Day (Aug. 10), 1557, a church dedicated to that saint was destroyed. In fulfillment of a vow of gratitude to St. Lawrence for the victory, Philip II built the Escorial on a bleak height of that name, 2700 feet above the sea, about 27 miles northwest of Madrid, and dedicated it to St. Lawrence. Begun by the architect Juan Bautista, of Toledo, in 1563, and completed in 1584 by Juan de Herrera, his pupil, it is not only the largest building in Spain, but also the most notable monument of the Griego-Romano style in Spain. Externally without artistic merit except for the fine dome of the church and the picturesque grouping with it of the six towers which vary the silhouette of the whole, it is remarkable for the ingenuity of its vast plan and the grand scale of the church. The Escorial occupies a rectangle of 750 by 580 feet, with a projecting wing on the rear or east side of about 175 by 120 feet, and comprises 13 courts, producing a fancied resemblance to the gridiron of St. Lawrence. The church, which dominates the entire design, fronts on a central court, entered from the west by the main portal, which is opened only to admit the King on his first visit, and a second time to receive his body for burial. The church is a noble design, 340 feet long by 234 wide, covering an area of 70,000 square feet, and crowned by a central dome 70 feet in diameter and 320 feet high externally. The interior of the church is of dark marble; previous to the destructive occupation by the French in 1808 it was rich in works of art. Its chief treasure is a life-size crucifix of ivory by Benvenuto Cellini (q.v.). From a small room in the adjoining palace wing Philip II, when sick and dying, was accustomed to listen to the celebration of the mass through a grated window opening into the chancel. Below the high altar of the church is the Pantheon, or royal tomb, an octagonal chamber with niches containing black sarcophagi in which rest the bodies of all the kings of Spain since the Emperor Charles V, with the exception of Philip V and Ferdinand VI. The palace of the Escorial was formerly rich in treasures of painting and contained works of Raphael, Rubens, Velasquez, Titian, and Tintoretto. The library, which was under the care of the monks of St. Jerome (driven out by the French), comprised 30,000 volumes and 4500 manuscripts, concerned mostly with Arabic literature. The Augustinian monks have been in charge of the conventual buildings since 1885. The Escorial has suffered many vicissitudes; fire in 1667, plunderings by the French in 1808 and 1813, and severe injury by fire from lightning in 1872 have necessitated extensive repairs.

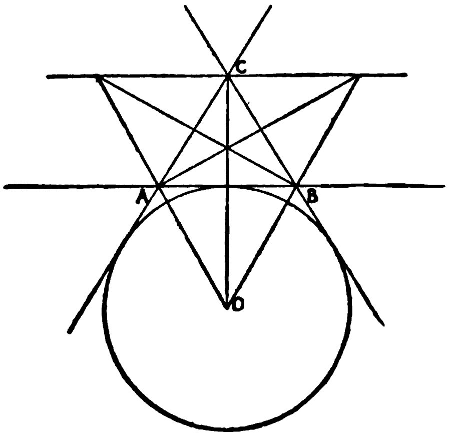
Bibliography. Los Santos, *Descripción del real monasterio de San Lorenzo del Escorial* (Madrid, 1657); A. Rotondo, *Historia artística . . . del monasterio de San Lorenzo* (Madrid, 1856–61); A. F. Calvert, *The Escorial: A Historical and Descriptive Account, etc.*, with 278 illustrations (London and New York, 1907). The emotional effect produced by the building is well described in C. Quinet, *Vacances en Espagne* (Paris, 1846); and John Hay, *Castilian Days* (New York, 1875).

ES'CORT (Fr. *escorte*, It. *scorta*, guide, from *scorgere*, to guide, from Lat. *ex*, out + *corrigere*, to correct, from *con*, together + *regere*, to direct). In the United States army ceremonial escorts are of two kinds—escorts of honor and funeral escorts. Escorts of honor are picked bodies of troops, detailed to receive and escort personages of high rank, civil or military. The troops assigned for this duty may be composed of cavalry, artillery, or infantry, but are invariably selected for their soldierly appearance and superior discipline. An officer is also detailed to attend the personage escorted and bear communications from him to the commander of the escort. The strength and character of such escort is largely determined by the status of the personage escorted. Funeral escorts are bodies of troops in numbers appropriate to the rank and grade of the deceased, detailed to attend and escort the funeral cortège, as may be ordered. The United States Army Regulations (1913) order that for the funeral escort of the Secretary of War, or general of the army, a regiment of infantry, a squadron of cavalry, and one battalion of field artillery form the detail; for the Assistant Secretary of War or the lieutenant general, a regiment of infantry, a squadron of cavalry, and a battery of field artillery; for a major general, a regiment of infantry, two troops of cavalry, and a battery of field artillery; for a brigadier general, a regiment of infantry, a troop of cavalry, and a platoon of field artillery; for a colonel, a regiment; a lieutenant colonel or major, a battalion or squadron; a captain, one company; a subaltern, a platoon; a noncommissioned staff officer, 16 men under a sergeant; a sergeant, 14 men under a sergeant; a corporal, 12 men under a corporal; a private, 8 men under a corporal; an enlisted man of field artillery, one section. The coffin is carried on a caisson, as a rule. Six pallbearers are selected from the grade of the deceased, as far as practicable. The above are escorts of ceremony. Escorts, in the sense of bodies of troops used as guards or protecting forces, are also employed with armies in the field; e.g., the infantry or cavalry escort of field artillery, escorts and guards for the supply trains in rear of an army, escorts and guards for a "convoy of prisoners," etc. Such escorts vary in strength from a few men to entire organizations and are often composed of two arms, usually cavalry and infantry.

ESCOSURA, ĕs'kō-sōō'rȧ, PATRICIO DE LA (1807–78). A Spanish statesman and author, born in Madrid. Early imbued with the revolutionary spirit rampant in the Spain of his day, Escosura was obliged to leave his country and study abroad. Upon his return he took to literature and published two successful novels, somewhat in the manner of Walter Scott—*El conde de Candespina* (1832) and *Ni rey, ni roque* (1835). Banished for his Carlist sympathies, he afterward became Undersecretary of State, Minister of the Interior, and Ambassador to Germany (1872). In 1876 he was elected a member of the Spanish Royal Academy. His most important works are: *Estudios históricos sobre las costumbres españolas* (Madrid, 1851); *Historia constitucional de Inglaterra* (1859); *La España artística y monumental* (1842–50); several plays, such as *La corte del Buen-Retiro* (1837); *Las mocedades de Hernan Cortés* (1846); *Bárbara Blomberg; Don Jaime el Conquistador; Roger de Flor* (Barcelona, 1861, two tomes in one quarto volume, illustrated).

ESCRIBANO, ĕs'krē-bä'nō. See HALFBEAK.

ESCRIBED CURVE (from Lat. *e*, out + *scribere*, to write, draw). A curve externally tangent to the sides of a polygon; e.g., an escribed circle of a triangle is tangent to one side and to the other two produced. The bisectors of the interior and exterior angles of a triangle intersect by threes in four points, of which the exterior ones are the centres of the escribed circles of the triangle. For example, *O* is the centre of an escribed circle of the triangle *ABC* in the preceding figure.



ESCRIBED CIRCLE.

ES'CROW' (AF. *escrowe*, OF. *escroue*, *escroe*, bond, Fr. *écrou*, entry in a jail book, from MDutch *schroode*, AS. *scrēade*, shred, slip of paper, Eng. *screed*). A sealed instrument placed in the hands of a third person to be kept by him until certain conditions are satisfied, and then to be delivered over to the obligee or grantee. While in the hands of the third person, awaiting fulfillment of the prescribed conditions, the instrument is not a perfect deed and does not operate as an obligation or a conveyance. As a rule, it takes effect from the second delivery. Hence, if it is a deed of property, the ownership passes from the grantor to the grantee as of the date of such delivery. But an exception to this rule is made when justice requires, or when necessary to protect the rights of persons who are not parties to the transaction. For example, if the grantor becomes mentally or legally incapacitated between the delivery to the third person and the delivery by the latter to the grantee, the deed will take effect as of the date of its first delivery, in order that it may be rendered valid. This is accomplished by the legal fiction of "relation." In order to uphold the deed, the act of final delivery is viewed as having been done at the time of the conditional delivery—as relating back to that date. See DEED; DELIVERY.

ES'CUAGE. See SCUTAGE.

ESCUERZO. See FERREIRO.

ESCUINTLA, äs-kēn'tlȧ. A town and capital of the department of the same name, Guatemala, 30 miles southwest of the city of Guatemala (Map: Central America, B 3). It is the centre of a district growing sugar cane, coffee, and cacao, and has considerable transit trade owing to its situation on the railroad from Guatemala to the port San José. Escuintla is a noted resort, frequented by great numbers of persons for its baths. Pop., 1910 (est.), 14,000.

ESCULA'PIANS. A Catholic order, historically connected with the work of Joseph Calasanctius (1556–1648). He was born in Aragon, was ordained a priest in 1583, went to Rome in 1592, and became interested in the education of poor and neglected children. Pope Clement VIII sustained his efforts, and in 1602 he laid the foundations of an order, the Piarists, devoted to this work. In 1614 the Esculapians were founded in Rome and have given themselves to education. In 1905 they had 2137 members and directed 150 colleges. In Cuba they have a college at Guanabocoa. In 1889 another order, the Pious Workers of St. Joseph Calasanctius, was founded at Vienna, for education and works of charity, especially among workingmen.

ES'CULENT SWALLOW. See SALANGANE.

ESCURIAL. See ESCORIAL.

ESCUTCH'EON (formerly *scutcheon*, from OF. *escusson*, Fr. *écusson*, from OF. *escu*, *escut*, Fr. *écu*, shield, from Lat. *scutum*, shield). A term in heraldry (q.v.), synonymous with shield. An escutcheon of pretense, or inescutcheon, is a small shield placed in the centre of the larger one and covering a portion of the charges on the latter, in which a man carries the arms of his wife when she is the heiress of her family. It is said to be carried *surtout*, or over all. Sometimes also a shield over all is given as a reward of honor.

ESDRAELON, ĕs'drȧ-ē'lon *or* es-drā'ē-lon

(Gk. Ἐσδρήλων, *Esdrēlōn*, the Greek form of the Hebrew word rendered as Jezreel in the English Bible, meaning "God has sown"). The greatest plain in Palestine, separating the mountain ranges of Galilee from those of Samaria, watered by the Kishon (Map: Palestine, C 2). It may be described as a triangle, having for its base the high hills—of which Mount Gilboa is the most important—forming the watershed between the Jordan and the Kishon, extending north and south from Nazareth to Jenin, a distance of about 15 miles. The northern boundary is the hills of Galilee westward from Nazareth about 12 miles to a point where the Kishon breaks through in a narrow pass leading to the seacoast and Acco. On the southwest is the Carmel range, extending from the sea to Jenin, about 20 miles. The plain was allotted to Issachar in the division among the tribes (Josh. xix. 17–23). It is of great fertility and has been of much importance in the annals of Palestine. Armies and caravans from all directions must pass through it, and, owing to its level character, it naturally became the field on which were fought the decisive battles for the possession or defense of Palestine and Syria. It was the scene of the triumph of Barak over Sisera (Judg. iv) and of Gideon over the Midianites (Judg. vii), as well as of the final defeat of Saul by the Philistines (1 Sam. xxxi) and of Josiah by Pharaoh Necho of Egypt (2 Kings xxiii. 29–30). The great contest between Elijah and the prophets of Baal is said to have taken place on its western border (1 Kings xviii. 17 et seq.). It was through the plain that Jehu came riding to Jezreel (2 Kings ix. 16 et seq.). The armies of Assyria and Egypt met there repeatedly, and in modern times the plain has figured in the wars of Napoleon. It has been supposed that this plain is referred to in Revelation as the battlefield par excellence, where "the kings of the earth and of the whole world" were to gather for the battle of the great day of God (Rev. xvi. 14, 16); but it is possible that "the place called in Hebrew Har-Magedon" is named after some chthonic divinity originally belonging to the mythical lore of Babylonia. Consult George Adam Smith, *Historical Geography of the Holy Land* (New York, 1895). See ARMAGEDDON.

ESDRAS (Gk. Ἔσδρας, Ezra), BOOKS OF. In the Latin Vulgate there are four books of Esdras. Two of these correspond to the canonical books of Ezra and Nehemiah; two are not regarded as canonical. As the last of them contains two chapters prefaced to the Apocalypse of Ezra and two chapters added at the end, it has been proposed to designate these as the fifth and sixth books of Esdras. The present confusion in regard to the titles of these books arises from the different order in the Greek version. A desirable uniformity may perhaps be brought about most easily by adhering to the nomenclature of the Vulgate, but using V Esdras for chaps. i and ii, and VI Esdras for chaps. xv and xvi of the Latin. The books would then be:

I ESDRAS, the Greek translation of the Hebrew and Aramaic canonical Book of Ezra substantially in the form it has in our Masoretic text. This is supposed by some scholars to be the original Greek version. Others maintain that, as in the case of the Book of Daniel, Theodotion's version was substituted for the earlier translation, and that I Esdras is the work of this translator living in the second century A.D. Whether this be so or not, it is significant that in the Greek manuscripts I Esdras appears as the first part of Esdras B.

II ESDRAS, the Greek translation of the canonical Book of Nehemiah substantially in the form it has in our Masoretic text. In the Greek manuscripts it appears as the second part of Esdras B, and as to its origin the same opinions are held as in the case of I Esdras.

III ESDRAS, a Greek translation of the books of Ezra and Nehemiah. Because of the marked difference in the order of the chapters in some parts, the additional story of Darius and the Three Pages, and some other peculiarities, this has been regarded as a later and independent rendering, of less value than I and II Esdras. But many eminent scholars look upon it as the oldest of our Greek versions, and consider its order as more likely to have been the original one, the story of Darius and the Pages as an interpolation, and the fact that this version was given the first place as Esdras A in the manuscripts as important. In early English Bibles the designation used by the Vulgate was followed; the Geneva Bible of 1560 followed the Greek and called it the First Book of Esdras, and that has often been done since then. It has its disadvantages, however, and the usage of Jerome may be adhered to without any agreement with his views as to its later date and inferior character being implied. On III Esdras, consult especially: Howorth, in *Proceedings of the Society of Biblical Archæology* (1901–02); Torrey, *Ezra Studies* (Chicago, 1910); Cook, in Charles, *The Apocrypha and Pseudepigrapha of the Old Testament* (2 vols., Oxford, 1913).

IV ESDRAS, an apocalypse ascribed to Ezra. It is extant in Latin, Syriac, Ethiopic, two Arabic, Armenian, and fragments of Saidic and Georgian versions. The Greek translation from which these were made has not been found. Yet all recent investigators are agreed that even this Greek text cannot have been the original, but that the author, or authors, wrote either in Hebrew or Aramaic, and probably in Hebrew. There is every reason to believe that a Salathiel apocalypse has been used by the author who writes in the name of Ezra. The opening statement "I, Salathiel, who am also Ezra" (iii. 1) is most naturally explained as coming from a compiler, who particularly in iii–x used the Salathiel apocalypse, written, as iii. 1 shows, in the thirtieth year of the downfall of the city, or in 100 A.D. As the eagle vision (chaps. xi, xii) can scarcely be earlier than the time of Domitian, and chaps. xiii, xiv clearly come from the same author as the vision of the eagle, the present work probably goes back to two sources united at the beginning of the second century A.D. This work has sometimes been called the Second Book of Esdras. Consult especially: Hilgenfeld, *Messias Judæorum* (Leipzig, 1869); Volkmar, *Das vierte Buch Ezra* (Tübingen, 1863); Violet, *Die Esra-Apokalypse* (Leipzig, 1910); Kabisch, *Das vierte Buch Esra* (Göttingen, 1889); Gunkel, *Das vierte Buch Esra* (Tübingen, 1900); Box, *The Ezra-Apocalypse* (London, 1912); Székely, *Bibliotheca Apocrypha* (Freiburg, 1913).

V ESDRAS, chaps. i and ii of the Latin IV Esdras, a Christian addition which treats of the rejection of the Jewish people by God and His choice of Gentile Christians. It is sometimes called II Esdras in Latin manuscripts.

VI Esdras, chaps. xv and xvi of the Latin IV Esdras, a Jewish addition containing chiefly invectives against sinners with predictions of wars and disasters. It is sometimes called V Esdras in Latin manuscripts. Consult the editions of Hilgenfeld and Volkmar. See Apocrypha.

ESERINE. See Calabar Bean; Alkaloids.

ESH′ER, William Baliol Brett, first Viscount (1815–99). An English jurist. He was educated at Westminster and at Caius College, Cambridge, and was called to the bar in 1840. He sat in Parliament during 1866–68 and then became Solicitor-General, but was in the same year appointed a justice of the Court of Common Pleas. He was a lord justice of appeal from 1876 to 1883 and then became Master of the Rolls. He was knighted in 1868, and raised to the peerage in 1897, at the time of his retiring from the bench. His judgments as Master of the Rolls are highly esteemed and constitute a valuable contribution to the development of equity jurisdiction.

ESK. The name of a small Scottish river of Dumfriesshire, formed by the confluence of the Black Esk and White Esk, which rise on the borders of Selkirkshire, near Ettrick Pen. It runs 35 miles south and forms for a mile the boundary between Scotland and England (Map: Scotland, E 4). For the last 8 miles it runs south-southwest through Cumberland, England, ending in the Solway Firth. It flows through some charming scenery, past Langholm, Canobie, and Longton. The upper part of its valley is called Eskdale Muir.

ES′KERS, ES′KARS, or **ES′CHARS** (Ir. *eiscir*, ridge). The name given in Ireland to large heaps of gravel that were accumulated during the Pleistocene period. They are identical with the åsar of Sweden and resemble kames (q.v.), but are longer and follow a winding course. The gravel is often heaped into narrow ridges 40 to 80 feet in height and from 1 to 20 miles in length. Similar winding ridges of gravel and sand are found in northern North America, where they are often associated with broad level-topped deposits of sands and gravels closely resembling river deltas. This association and their peculiar structure and configuration have led to the belief that eskers are deposits formed by streams which flowed beneath the ice sheets of the Glacial period. In general the eskers follow the direction in which the continental glacier moved.

ESKILSTUNA, ĕs′kĭls-tōō′nȧ (Swed., Eskil's town). A city of Sweden, situated on both sides of the Eskilstunaå, over 60 miles west of Stockholm (Map: Sweden, F 7). The town, divided into old and new sections by the river, is regularly built in the new quarter, and is famed for its iron and steel manufactures, especially the gun factory on an island in the river. The town manufactures fine cutlery. There is regular communication with Stockholm by steamship as well as by rail. Pop., 1900, 13,663; 1912, 28,485. Eskilstuna is named after St. Eskil, the English apostle of Christianity in Södermanland, who is supposed to have been buried here after his martyrdom.

ES′KIMO. A race confined to the Arctic regions of America and the extreme northeastern part of Asia. The name means "raw-fish eaters" and was applied to them by their Algonquin Indian neighbors living south of them. The American Eskimo call themselves Innuit, i.e., men; their congeners in Asia giving themselves the name Yuit or Yu-kouk, other forms of the same word. The Eskimo have been so absolutely secluded in their habitat that anthropologists have had great trouble in dealing with the question of their origin. Dr. H. Rink, who made a life study of Greenland and its people and is the greatest authority on them, held that most Eskimo weapons and implements are of American origin; he advanced the theory that, even though the Eskimos originally may have come from Asia, they developed as a race in the interior of Alaska, whence they finally migrated northward and spread out along the coasts of the ice sea. He said that their speech is closely connected with the primitive dialects of America, while their legends and customs resemble, or at least suggest, those of the Indians. Later the researches of Dall, Olivier, Nordquist, Krause, and others led to the conclusion that the Eskimo were derived directly from peoples of the Asiatic polar regions, some of whom came to America across the narrow Bering Strait. Within recent years the investigations of Hrdlicka, Boas, and others have borne out the early view of Rink, since anatomically as well as culturally the Eskimo seem to have sprung from the same stock as the Indians.

Though the evidence as to the origin of the Eskimo is not complete, there is at least good reason for the theory that within a comparatively recent period they developed their individuality either on the north Atlantic coast of North America or in the vicinity of Hudson Bay, from whence they spread into Greenland and Alaska, the Aleutian Islands, and parts of Siberia. They must have reached Greenland before the Norwegian colonies of Österbygd and Vesterbygd were established, for Eric the Red and others found in both these districts the ruins of human habitations, fragments of boats, and stone implements, which they thought must have belonged to a feeble folk whom they therefore called Skrellings (weaklings). Nansen and others believe that at this period the Greenland Eskimo were living north of 68° N., where seals and whales abound, and that they did not make their permanent settlements in South Greenland until after they had destroyed the Norwegian colonies there in the fourteenth century.

The regions inhabited by the Eskimo extend from Bering Strait over the northern coast of America and its groups of Arctic islands to the east coast of Greenland. With a habitat spreading over 3000 miles, the Eskimo have a wider geographical range than any other aborigines. In spite, however, of the great distances, which have divided the various groups from one another for probably more than 1000 years, the race has preserved the most striking uniformity in language, habits, and mode of life, excepting in so far as certain tribes have been influenced by contact with the white men. The insignificant differences of language among these isolated groups have been often remarked. Common to all are the same stem words, the same affixes. The chief characteristic of the language is that it is highly polysynthetic, single words of complex structure expressing ideas that in English would fill out whole sentences. Mr. Hugh Lee, who learned the language among the Smith Sound natives of north Greenland, says that he had little difficulty in communicating with the Eskimo of Cape Prince of Wales, Alaska.

A similar condition has been observed among the Eskimo of Labrador, the Arctic archipelago, and Greenland, though dialectic differences exist between the various groups and villages. However, the Aleutians are so far removed as to make their speech unintelligible to the mainland natives.

The uniformity of language is not so great, however, as to preclude the linguistic classification of the Eskimo. In the first place, we have two distinct divisions, the Aleutians and the Eskimo proper. The former is a small compact group and may be treated as a unit; the latter, on the other hand, is a widely distributed people with many cultural subdivisions. According to culture these seem to fall in the following divisions:

1. *The Greenland Eskimo.* Occupying the lower part of Greenland and in two groups, those of the east coast, now extinct, and those of the west coast, who have become civilized.
2. *The Central Eskimo.* Including those of Smith Sound in north Greenland, made famous by Peary; those of eastern and northern Baffin Land; those of western Hudson Bay; on Boothia Felix; and the now extinct people of Southampton Island.
3. *The Eskimo of Labrador.* Extending along the coast from near Newfoundland to Hudson Bay and including a few settlements on the southern shore of Baffin Land.
4. *The Eskimo of Banks Land.* Including those on Victoria Island and Coronation Gulf, recently visited by Stefansson.
5. *The Mackenzie River Eskimo.* Those at the mouth of the Mackenzie and along the coast between Cape Bathurst and Herschel Island.
6. *The Alaskan Eskimo.* All those in Alaska except the Aleutians.
7. *The Siberian Eskimo.*

Our knowledge of divisions four, five, and six is still rather vague, so that the above grouping must be considered tentative. For the other groups, however, we have sufficient data to make the classification definite.

No satisfactory estimate of the number of living Eskimo can be made. According to the census of 1910 the Aleutians numbered 1451 and the Alaskan Eskimo 12,636. The Greenland Eskimo are estimated at 10,000, and it is unlikely that all the others will total 9000. See ALASKA.

The Eskimo are between 62 and 64 inches in height, with broad, round faces and high cheek bones. They are well built, usually fat, and many of the men have remarkable muscular development; the eyes are narrow, the hair is straight and jet black, the beard is very thin and often entirely wanting. The skin is light brown or dark brown. They are a short-lived people, rarely attaining an age much beyond 60 years. In Greenland and Alaska they have mixed with the whites until there is a very large percentage of mixed bloods. Note should also be taken of the peculiar "blond" or "white" group discovered by Stefansson, near Coronation Gulf. (See WHITE ESKIMOS.) All the groups, excepting those which have long had intercourse with the white race, may be classed in point of development with the prehistoric races of the age of ground-stone tools, though the Smith Sound natives, long before they met the whites, obtained iron from the Cape York meteorites, with which they tipped their weapons. This tribe, and indeed all the Greenland Eskimo, have no wood except such fragments of driftwood from Siberia as they have picked up on the shore and such pieces as they have obtained from white men.

The sustenance of the Eskimo is chiefly derived from the capture of seals and cetaceous animals, the pursuit of which has kept them inhabitants of the seashore. The seal is their staple winter food and their most valuable resource, supplying them with dog food, clothing, boats, tents, harpoon lines, light, and heat. The walrus, narwhal, whale, bear, and to a smaller extent the deer, fox, and hare, also afford important supplies. Thousands of birds are stored for winter use. In summer caribou are hunted, the skins of which furnish the clothing for the next winter.

The men are constantly employed in hunting or in the manufacture and care of their hunting contrivances, among which is the kayak, in which they chase their sea prey. The kayak is a swift and seaworthy canoe, made of skin, entirely decked over except for the round hole in the middle in which its one occupant sits. It is propelled by a double-bladed paddle. The oomiak (umiak), or woman's boat, also built of skin, but open, is large enough to carry several passengers and also freight. It is paddled by women. The harpoon is a remarkably ingenious implement whose barb detaches itself from the handle when the animal is hit and, being attached to a float or drag, prevents the escape of the game. The dog sledge is common everywhere except among the Eskimo of southwestern Greenland. In regions where iron is obtainable from the white men, iron runners are now largely substituted for those of ivory or whalebone, formerly used. Eskimo dogs are admirably adapted for sledge work.

The dwellings are always of two kinds—tents for summer and houses or huts for winter use. The tents, or tupiks, are made of sealskin; the igloos, or winter houses, are far more varied in structure among the different groups. They are usually built of stones, chinked and covered with moss and banked up with snow. The entrance is a long passage high enough to admit a man crawling upon hands and knees. In some places—e.g., in northern Alaska—huts are half underground. Many of the western and Labrador Eskimo build their houses chiefly of wood. Some of the winter houses of the East Greenland natives shelter 40 to 60 persons. The temporary winter houses, built during journeys, are made of blocks of snow, piled in a shape somewhat like that of a beehive. This is also the permanent winter house of the Central and Banks Land divisions. The dress for men and women consists of boots, trousers, and a jacket with a hood, which can be drawn up to cover the head. Women nursing children carry their infants in hoods. The boots of the women are higher than those of the men, and indeed among the Smith Sound Eskimo extend to the thighs. Except where trade is carried on with the whites, the clothing is entirely of furs and the skins of birds, and may be considered perfect for the conditions under which it is worn.

In the relations between the sexes there is much laxity, but where missionary influences prevail the marital relations are of the conventional civilized type, and the sexual morality of many natives is of a high order. There is much that is admirable in these simple-minded people. They are honorable with regard to property, children and the aged and infirm are well cared for, and generosity and hospitality are characteristic traits. Most of the products of the hunt are common property. The Eskimo are naturally cheerful, merry, and light-hearted, fond of song and music and with some skill in its production, though among tribes not in close contact with white men the only musical instrument is a kind of small tambourine made of membrane stretched over an oval bone frame. They are friendly to strangers, and warfare is almost unknown among them. Many are adepts in making carvings of walrus ivory, the Alaska natives excelling in the ornamentation and finish of these products. Those natives who are not under missionary influence have the vaguest religious ideas. They believe in invisible powers or demons which rule over the riches of the sea, and a special function of the angekoks, or shamans, is to propitiate these mysterious influences.

Bibliography. H. Rink, *Tales and Traditions of the Eskimo* (London, 1875); id., *Danish Greenland* (ib., 1887); id., *The Eskimo Tribes* (ib., 1887); Josephine Diebitsch Peary, *My Arctic Journal* (New York, 1893); Nansen, *Eskimo Life* (London, 1894); R. E. Peary, *Northward over the Great Ice*, vol. i, appendix ii; F. Boas, "The Central Eskimo," *Sixth Annual Report of the Bureau of Ethnology*, pp. 399–660; Murdock, "The Point Barrow Eskimo," *Ninth Annual Report of the Bureau of Ethnology* (1886–87); Nelson, "The Eskimo about Bering Strait," *Eighteenth Annual Report of the Bureau of Ethnology*, part i (1896–97); W. Thalbitzer, *A Phonetical Study of the Eskimo Language* (Copenhagen, 1904); V. Stefansson, *My Life with the Eskimo* (1913).

ESKIMO DOG. See SLEDGE DOG.

ESKI-SHEHR, ĕs′kė-shĕ′h'r. A town and railway junction in the Kutai Sanjak, Brusa, Asiatic Turkey, on the Pursak Su, 164 miles west of Angora by rail (Map: Turkey in Asia, B 2). It is noted for its warm mineral springs and valuable meerschaum mines. It is the ancient Dorylæum. Pop., 20,000, of which one-third are Christians and the rest Mohammedans.

ESKI-SHEHR. The ancient section of the town of Malatia (q.v.) in Asia Minor.

ESKI-ZAGRA, ĕs′kė zä′grȧ (Turkish name, meaning *Old Zagra;* Bulg. *Stara-Zagora*). A town of Eastern Rumelia, Bulgaria, capital of the Department of Stara-Zagora, situated at the southern base of the Balkans, 45 miles south of Tirnova (Map: Turkey in Europe, E 3). In the neighborhood are numerous gardens, and rose oil is one of the chief products of the town. There are also a number of mineral springs. Eski-Zagra is advantageously located at the junction of the chief passes in the central Balkan Range. In July, 1877, a battle was fought near Eski-Zagra between the Russians under General Gurko and the Turks under Suleiman Pasha, as a result of which the Russian forces were thrown back. Pop., 1887, 16,039; 1910, 22,003; composed chiefly of Bulgarians, Turks, and Jews.

ES′LA. A river of Spain, 150 miles long, rising at the base of the Peña Urbina, one of the highest peaks of the Cantabrian Mountains, and flowing in a general southerly direction through the provinces of León and Zamora to its confluence with the Duero, about 20 miles below the city of Zamora (Map: Spain, C 2).

ESLAVA, ā-slä′vȧ, MIGUEL HILARION (1807–78). A Spanish composer and theorist. He

was born at Burlada, near Pamplona. In 1828 he became maestro in Ossuña Cathedral, where he also took holy orders. In 1832 he was appointed to the same position at Seville, and in 1844 he became court maestro to Queen Isabella at Madrid. His principal works are the three operas *El solitario* (1841), *Las treguas de Tolemaida* (1842), and *Pietro el crudele* (1843); the valuable collections *Museo orgánico español* and *Lira sacro-hispaña* (1869); about 150 masses, motets, and psalms, and a brief history of the church music of Spain.

ESLAVA, SEBASTIÁN DE (1714–89). A Spanish soldier, born in Navarra, and one of the cadets with whom the Real Academia Militar of Barcelona was founded. Having served with distinction in the wars of Philip V, he was appointed in 1738 lieutenant general, and in 1740 Viceroy of New Granada (the present Republic of Colombia). He refortified the fort of Cartagena, which in 1741 he brilliantly defended against a strong English force under Admiral Sir Edward Vernon. He served as Viceroy until 1748. On his return to Spain he was advanced to the grade of captain general and in 1750 was made Governor of Andalusia (a highly coveted post at that time). The same year he was appointed director of the Spanish infantry (a post he held for four years). Then, in 1754, he became Secretary of State for War. On the accession of Charles III to the throne Eslava retired to private life, living in Madrid till his death.

ESMANN, ĕs′mȧn, GUSTAV (1860–1904). A Danish author and journalist, born and educated at Copenhagen. He studied law, but abandoned it for literature, his first production being the two tales published in the volume *Gammel Gæld* (1885). His plays, which are frequently performed in Denmark, Norway, and Sweden, are superficially effective, but lacking in dramatic characterization. Among them may be mentioned: *I Stiftelsen* (1886); *I Provinsen* (1890); *Den kære Familie* (1892); *Magdalene* (1893); *Den store Maskerade* (1895); *Vandrefalken* (1898); *Det gamle Hjem* (1899); *Alexander den Store* (with Sven Lange); *Sangerinden* (1901).

ESMARCH, ĕs′märk, JOHANNES FRIEDRICH AUGUST VON (1823–1908). A German surgeon, born at Tönning, Schleswig-Holstein. He studied medicine at Kiel and Göttingen, and in the Danish War of 1848 served as lieutenant, as assistant surgeon, as chief physician of the citizens' hospital at Flensburg, and lastly as adjutant of Dr. Stromeyer. He became professor and director of the hospital at Kiel in 1857, and during the Schleswig-Holstein War (1864) he was eminent in hospital work, and during the Franco-German War (1870–71) he was physician general and consulting surgeon to the army. In 1871 he returned to Kiel as professor of surgery. His second wife was the Princess Henriette of Schleswig-Holstein. He was for many years the greatest authority on gunshot wounds. He originated valuable improvements in barrack hospitals, ambulances, etc., and was the inventor of the bloodless method of operating on the extremities, which consists of applying a bandage firmly to the extremity from its distal point upward, thus pressing the blood out of the limb before applying the tourniquet. In this way danger from venous congestion after constricting the limb is avoided. This method was invented by Esmarch independently and in ignorance of similar suggestions by Grandesso Silvestri of Vicenza. Among his medical works are: *Ueber Resektionen nach Schusswunden* (1851); *Beiträge zur praktischen Chirurgie* (1853–60); *Ueber chronische Gelenkentzündungen* (1867); *Ueber den Kampf der Humanität gegen die Schrecken des Krieges* (1869; 2d ed., 1899); *Der erste Verband auf dem Schlachtfelde* (3d ed., 1899); *Verbandplatz und Feldlazarett* (1871); *Ueber künstliche Blutleere bei Operationen* (1873); *Handbuch der kriegschirurgischen Technik* (1877 and several subsequent editions); *Die erste Hilfe bei plötzlichen Unglücksfällen: Ein Leitfaden für Samariterschulen* (17th ed., 1901).

ESMARCH, Karl (1824–87). A German jurist, born at Sonderburg and educated at Kiel, Bonn, Heidelberg, and Berlin. In 1855 he became professor of Roman law at Cracow and two years later at Prague, where he remained until his death. Besides a number of epic poems, published under the name Karl von Alsen, he wrote the well-known legal work entitled *Römische Rechtsgeschichte* (2d ed., 1877–80).

ESMENARD, ĕs'mā'när', Joseph Alphonse (1769–1811). A French publicist and poet, born at Pélissane (Bouches du Rhône). After traveling extensively he settled in Paris and became coeditor of *La Quotidienne* (1797) and *Le Mercure de France* (1798). During the Consulate he was sent as secretary to the Admiral Villaret-Joyeuse, Governor of Martinique, and afterward was Consul to the island of St. Thomas (1804). A year later he published his poem *La navigation* (1805), which had its inspiration many years before in his early travels in America. He was received into the Academy in 1810 and shortly after incurred the displeasure of Napoleon by a satirical article on Russia in *Le Journal de l'Empire,* for which he was obliged to leave France.

ESMERALDA, ĕs'mā-räl'dȧ. The sweetheart of Quasimodo, in Victor Hugo's *Notre Dame de Paris.*

ESMERAL'DAN. A linguistic stock of South American Indians once occupying the entire course of Esmeraldas River in northwestern Ecuador. Consult Rivet, in *L'Année linguistique* (1908–10), and Seler, *Ges. Abh. z. amer. Sprach- u. Altertumsk.*, vol. i, pp. 49–64 (Berlin, 1902).

ESMERALDAS, ĕs'mā-räl'dȧs. A port of Ecuador and capital of the province of the same name, situated at the mouth of the Esmeraldas River on the Pacific Ocean (Map: Brazil, A 3). The surrounding region produces tagua (see Ivory, Vegetable), tobacco, and cacao. The manufacture of cigars is the chief industry. Tagua, rubber, sugar, and cattle are the principal exports. The name was given by the Spaniards from the emeralds discovered in the vicinity. Pop., about 3000.

ES'MOND, Beatrix. A cousin of Henry Esmond, in Thackeray's novel of that name; a beautiful, vain, ambitious woman who also appears in *The Virginians* as Madame de Bernstein.

ESMOND, Henry V. (1869–1922). An English dramatist and actor, whose real name is Jack, born at Hampton Court, England, and educated by tutors. In 1885 he went on the stage, but after 1896 devoted himself chiefly to writing. His best-known plays are: *One Summer's Day* (1897); *Grierson's Way* (1897); *The Wilderness* (1901); *When we Were Twenty-one* (1901); *The Sentimentalist* (1902); *My Lady Virtue* (1902); *Billy's Little Love Affair* (1903); *A Young Man's Fancy* (1912). Consult William Winter, *The Wallet of Time* (2 vols., New York, 1913).

ESNAMBUC, ĕs'näN'bụk', Pierre Belain d' (1585–1636). A French navigator and founder of the French settlements in the West Indies. He was born at Allouville, and as commander of a vessel in the Caribbean took possession of the island of St. Christopher for the purpose of colonization. A plan suggested by him to the governments of France and England, whereby the island was to be divided between the two countries, was approved, and in 1626 D'Esnambuc transported more than 500 immigrants to the new possession. Between the years 1627 and 1636 he established settlements on Martinique and other islands of the Caribbean. The town and fort of St. Pierre, completely destroyed by a volcanic eruption, May 8, 1902, were founded by him.

ES'NE (Egyptian *Snêt*, Coptic *Snê*). An Egyptian town on the left bank of the Nile (lat. 25° 15' N., long. 32° 8' E.), about halfway between Erment and El Kab (Map: Egypt, C 2). By the Greeks it was called Latopolis, from the fish latos which was revered there. Esne was a place of considerable importance, especially in Roman times. The temple, dedicated to the god Knum, was probably built under the Ptolemies on the site of an older structure. The great portico of 24 columns contains many inscriptions of Roman emperors. One of these bears the name of Decius (250 a.d.) in hieroglyphics. Near Esne is the ancient convent of Ammonius, said to have been founded by the Empress Helena in honor of the martyrs who perished here in the persecution under Diocletian. Near here Coptic buildings have been discovered. Consult: Champollion, *Notices descriptives* (Paris, 1844); Mariette, *Monuments of Upper Egypt* (London, 1877); Lane-Poole, *Egypt* (ib., 1881).

ESOP. See Æsop.

ESOPHAGUS. See Œsophagus.

ESO'PUS WAR. An intermittent conflict between the Indians and the Dutch settlers at Esopus (now Kingston) in Ulster Co., N. Y., which began in the summer of 1658. Some Indians employed as field hands by the Dutch, while drunk and boisterous, were fired upon by the farmers. This gave rise to a series of bloody reprisals on the part of the savages, the most serious of which was the destruction of the village of Wiltwyck (the Dutch equivalent for the Indian Esopus), when 40 women and children were carried off as prisoners and 21 men were killed. Governor Stuyvesant of New Netherland, in retaliation, immediately sent up a force which punished the Indians. In May, 1664, a treaty of friendship was concluded.

ES'OTER'IC (Gk. ἐσωτερικός, *esōterikos*, inner, from ἔσω, *esō*, within). A word used at first by the ancient Greeks of those initiated into the Mysteries, but later applied in ancient as in modern times to mark a distinction supposed to exist between certain classes of the writings or discourses of Aristotle (q.v.). The esoteric works, designed for the disciples, were thought to be less popular, either in style or in treatment, and to contain more technical doctrines, than the exoteric works, which were designed for the public. The word *esoteric* is not used by Aristotle himself, and it is doubtful if his use of the word *exoteric* implies this distinction; he may be referring merely to "popular treatises." Grote understands the word *exoteric*, as used by Aristotle, to refer to the *dialectic* method, as opposed to the *nonexoteric* (*esoteric*), or *didactic*, method. The term was also applied to the special teachings of Pythagoras. Consult Christ-Schmid, *Geschichte der Griechischen Litteratur*, i, 673 (5th ed., Munich, 1908).

ESPALIER, ĕs-păl′yẽr (Fr., fruit wall, It., *spalliera*, from Lat. *spatula*, broad piece, blade). A system of training fruit trees or vines on a wall. The trees are generally grown as cordons (q.v.). The branches are fastened to a trellis which is supported by the wall. Trees which are trained on a trellis opposite an espalier, usually with a path between, are called contraespaliers.

ESPALIER PLANT. A plant which cannot grow erect without outside mechanical support; hence a prostrate or procumbent plant. See STEM.

ESPARSETTE. See SAINFOIN.

ESPARTERO, å′spär-tā′rô, BALDOMERO (1792–1879). A Spanish general and statesman. He was born Feb. 27, 1792, at Granátula in La Mancha and was educated at the University of Almagro. Upon the outbreak of the war against Napoleon he joined the patriot forces and fought until 1814, going the next year to South America. There he served with the Spanish forces throughout the War of Liberation waged by the South American colonies. He returned in 1824 to Spain and took a prominent part in the civil conflicts which followed the death of Ferdinand VII and the accession of Isabella II. He rose to be lieutenant general, and twice, as commander in chief, saved Madrid from the Carlist forces—once in August, 1836, and again in September, 1837. In 1836, too, he twice forced the Carlists to raise the siege of Bilbao. In 1839, by making with Maroto the famous convenio de Vergara (whereby the titles and ranks for nearly 1000 Carlist officers were recognized), he practically ended the war and drove Don Carlos from Spain—a service for which he was made Duke of Victoria and Duke of Morella and grandee of Spain, after having been created Count of Luchana for his bravery at Bilbao and Luchana. He now became practically military dictator of Spain, allied with the Progressist party, and in 1841, after the Queen Mother María Christina was forced to resign the regency, he was appointed by the Cortes in her place. His government was marked by energy and ability; but in 1843 a combination of parties naturally inimical to each other, the Republicans and Moderates, overthrew his government and drove him into exile. He spent four years in England and in 1848 returned to Spain, living quietly at Logroño till 1854, when an insurrection of the people compelled the Queen Mother to leave the kingdom. Espartero, supported by the Progressists, and General O'Donnell, supported by the Conservatives, now conducted a coalition government for two years; but the Progressists lost their hold in that time, and Espartero gave way (July, 1856) to O'Donnell. After 1856 Espartero refused to be active in politics, and in 1857 he resigned his dignity as senator. After the revolution of 1868, which resulted in the expulsion of Queen Isabella, he gave his full adhesion to the provisional government, though he took no part in its proceedings. In 1870 he declined to become a candidate for the throne of Spain. King Amadeo made him Prince of Vergara. In 1875 he adhered to King Alfonso. Consult Florez, *Espartero, Historia de su vida militar y politica* (Madrid, 1843–44), and Mariana, *La regencia de Baldomero Espartero* (ib., 1870). See SPAIN.

ESPAR′TO. A grass (*Stipa tenacissima*) extensively employed in the manufacture of paper in Great Britain. Esparto is grown in northern Africa, Spain, and adjacent countries, from whence it is shipped for paper stock. A part of the esparto paper stock is derived from *Lygeum spartium*, a grass of the Mediterranean region.

ES′PER, EUGEN JOHANN CHRISTOPH (1742–1810). A German naturalist, born at Wunsiedel. He was appointed professor of natural history at Erlangen in 1782 and director of the cabinet of natural history there in 1805. His works on butterflies, *Die europäischen Schmetterlinge* (new ed., 1829–39) and *Die ausländischen Schmetterlinge* (new ed., 1830) are notable.

ESPERANTO, ā′spå-rän′tô. The most popular among the proposed auxiliary international languages. It has been indorsed by such men as Berthelot in France, Sir William Ramsey in England, Ostwald in Germany, and the philologist Schuchardt in Austria. It has been introduced in many schools as a free elective, and the Chamber of Commerce in London has put it on its list of examinations for candidates wishing to apply for positions. It was invented by a Russian physician, Zamenhof, whose first publication on the subject, in 1887, was signed "Dr. Esperanto" (Hopeful). The directing principle is to make use of everything that is common to the civilized languages and drop what is special to any one of them. In pronunciation, the English *w* and *th*, the French *u*, the Spanish *j* and *ñ*, are dropped; different sounds represented by the same letter are distinguished, e.g., *g* is always guttural (*good*), while *ĝ* is used in words like *gem;* and so for other letters; thus, the strict phonetic spelling is possible: one sound, one letter. The principle of internationalism is specially obvious in the vocabulary: words common to all civilized languages are chosen first; then those common to all but one language are adopted; then in all but two, and so forth. But when there is no one international word, a selection is usually made, though somewhat at random, between Romance and German words. It may be noted that Slavic roots are less numerous than those of the above languages. A system of about 30 prefixes and suffixes, also borrowed from living languages. renders easy the task of memorizing. Instead of having one word for *good* and one for *bad*, Esperanto says *good* and *not-good* (bona, malbona), which is not always true; the infix *in* marks the feminine; *patro*, father, *patrino*, mother; this principle applies in nouns, adjectives, adverbs, verbs, etc. Again, instead of two words like *cut* and *knife*, Esperanto will say *cut* and *cutter* (tranĉi, tranĉilo). The grammar has 16 rules without exceptions. The ending *o* always represents a noun, *a* an adjective, *e* an adverb, *j* the plural, *i* the infinitive of a verb, *as* the present tense, *is* the past, *os* the future, *u* the imperative, *us* the conditional, etc. Possessive adjectives are formed by adding the adjectival *a* to the personal pronouns, *mi*, I, *mia*, my; the same for ordinal adjectives. *tri*, three, *tria*, third. For interrogation *ĉu* is placed before an affirmation.

The adaptability and flexibility of Esperanto have been illustrated by translations of scientific, philosophical, and literary works. There are Esperanto clubs in nearly all large cities. Consult O'Connor, *Esperanto Complete Text-Book* (New York). Following is a specimen of Esperanto, with the English translation:

Esperanto Text: Simplà, fleksebla, belsona, vera internacia en siaj elementoj, la lingvo Esperanto prezentas al la mondo civilizita la solan veran solvon de lingvo internacia; car, tre facile por homoj nemulte instruitoj, Esperanto estas komprenata sen peno de la personoj bone edukitaj.

"Simple, flexible, well sounding, truly international in its elements, the language Esperanto presents to the civilized world the only true solution of the international language; for, very easy for people not much learned, Esperanto is understood without trouble by well-educated people."

There is little doubt that the present spread of Esperanto would have been much greater, had it not been for the creation of new letters by its author. This is the first international language to make such an attempt, with the result that many sympathetic newspapers and other publications, not possessing the special characters like ĉ, ĝ, ĥ, ĵ, ŝ, and ŭ, did not find it possible to print without great difficulty extracts and articles in Esperanto. Besides philologists, whose objections to an international language are more or less well-known, others have found fault with many of the essential principles of the language. Thus, the principle of internationality of roots is not strictly followed; the accusative case is considered by some unnecessary; while speakers of the Romance languages object to the use of *-a* to indicate adjectives and *-o* to indicate nouns, as confusing to them. Many also object to the use of the feminine form of the definite article (*la*) of the Romance languages instead of the simpler English *the*. While the verb is in general good, there is no doubt that the noun could be improved upon. The Germanic words, which are usually poorly selected, could either be omitted or reduced to the common Germanic form. Finally, the mixture of languages, it is maintained, renders it difficult for one to acquire the vocabulary.

But in spite of these objections and many others that could be adduced, Esperanto has well served its purpose. Even if it is doomed to die, as many believe, it has shown the possibility and the necessity of a means of international communication if for no other means than those of business. Excess of enthusiasm, such as the translation of Shakespeare into Esperanto, has often provoked the gibes of the opposition. Of the many publications issued during recent years which treat of Esperanto, it will suffice to note the following: Ivy Kellerman, *A Complete Grammar of Esperanto* (New York, 1910); Bullen, *Lessons in Esperanto* (ib., 1908); Rhodes, *English-Esperanto Dictionary* (ib., 1908), which is based upon the *Fundamento* of Dr. Zamenhof, as well as the literature in Esperanto and the national Esperanto dictionaries bearing the "aprobo" of Zamenhof: Zamenhof, *Die Weltsprache "Esperanto": vollstandiges Lehrbuch*, trans. into German by Trompeter (Nuremberg, 1891); id., *Wörterbuch der internationalen Esperanto Sprache* (ib., 1891); Méray, *La langue internationale auxiliaire "Esperanto" et la litterature scientifique* (Paris, 1902); Brugmann and Leskien, *Zur Kritik der künstlichen Weltsprachen* (2d ed., Strassburg, 1907); Underhill, *Esperanto and its Availability for Scientific Writings* (Denver, 1908); and the periodical *The British Esperantist*. See INTERNATIONAL LANGUAGE.

ESPERSON, ā'spâr-sōn', PIETRO (1833–). An Italian jurist, born at Sassari, Sardinia. He studied at the university there, and was instructor in law in the university from 1860 to 1865. In the latter year he was appointed professor of international law at the University of Pavia. His works include: *Rapporti giuridici tra i belligeranti e i neutrali* (1865); *La questione Anglo-Americano del' "Alabama," discussa secondo i principii del diritto internazionale* (1869); *Giurisdizione internazionale maritima* (1877); *L'Angleterre et les capitulations dans l'île de Chypre au point de vue du droit international* (1879); *Le legge sulla naturalizzazione in Italia* (1886); *De' dritti di autore sulle opera dell' ingegno ne' rapporto internazionali* (1899).

ESPINAL'. A town of Colombia, in the Department of Tolima, 70 miles southwest of Bogotá. It has tobacco and pottery industries. Pop., 10,000.

ESPINAL (Sp., thorny), or **CHANAR.** See THICKET.

ESPINAS, ā'spē'nä', VICTOR ALFRED (1844–1922). A French philosopher and sociologist, born at Saint-Florentin. In 1893 he became professor of social economy at the Sorbonne, Paris, and in 1904 professor of the history of the doctrines of economics. He wrote: *Les sociétés animales* (1877); *Histoire des doctrines économiques* (1893); *La philosophie sociale du XVIIIème siècle et la Révolution* (1898); *La troisième phase et la dissolution du merchantilisme* (1902). He translated, with Th. Ribot, Spencer's *Principles of Psychology* (1874).

ESPINASSE, ās'pē'näs'. See L'ESPINASSE.

ESPINASSE, ESPRIT CHARLES MARIE (1815–59). A French general, born at Castelnaudary. He was made a general and aid-de-camp to Louis Napoleon after the coup d'état of Dec. 2, 1851, in recognition of his service in invading the National Assembly at night and seizing the quæstors. During the Crimean War he fought at the taking of the Malakoff. As Minister of the Interior from February to June, 1858, he presented to the French Legislature the famous Loi de sureté générale. He then became senator. He was killed at Magenta.

ESPINEL, ā'spē'nāl', VICENTE MARTÍNEZ (1551–1624). A Spanish poet, novelist, and musician, born at Ronda, Andalusia. After studying at the University of Salamanca, from which he was expelled in 1572, he served as a soldier in Italy and Flanders and upon his return to Spain, about 1584, prepared to enter the church, taking orders in 1587 and becoming chaplain of Ronda in 1591. For absenting himself from his living without permission he lost his cure. Later he was made choirmaster of Plasencia. He revived a form of poetry known as *décimas*—stanzas of 10 octosyllabic verses—which came thereafter to be called *espinelas*. He was credited by his contemporaries (*inter alios* Lope de Vega) with having added a fifth string to the guitar. This is now disputed on evidence tending to prove that at earlier dates there were guitars with five, and even with six, strings. His most important work is a romance, *Relaciones de la vida del escudero Marcos de Obregon* (1618), which is largely an autobiography with embellishments. For many years Lesage was accused of having ruthlessly pillaged *Marcos de Obregón* for his *Gil Blas*. The matter has been thoroughly cleared up, and it is shown that Lesage's total borrowings from French and Italian sources, as well as from this and other Spanish sources, represent only about one-fifth of the bulk of *Gil Blas*. Espinel also wrote a translation of Horace and lyrical poems, *Diversas rimas de Vicente Espinel* (1591). He left in manuscript many poems which have remained inedited because of their licentiousness. Consult Pedro Salvá y Mallén, *Catálogo de la biblioteca de Salvá* (Valencia, 1872), for some previously unpublished poems. Consult also J. Pérez de Guzmán's edition of *Marcos de Obregón* (Barcelona, 1881) with introduction, and Leo Claretie, *Lesage romancier* (Paris, 1890).

ESPINOSA, â'spê-nō'sä, GASPAR DE (?1484–1537). A Spanish lawyer and soldier, born at Medina del Campo. In 1514 he accompanied Pedrarias Dávila to America and became chief justice of the colony at Darien. He was judge of the tribunal which condemned to death Balboa, Dávila's predecessor as Governor, but refused to pass sentence upon the famous explorer until ordered to do so by the Governor. He abandoned his judicial position and was the leader of several expeditions against the Indians, whom he treated with great cruelty. In 1518 he founded Panama and several years later returned to Spain, where he was rewarded by the Emperor Charles V and was appointed a crown officer in Santo Domingo. He returned to Panama, and when Pizarro fitted out his second Peruvian expedition became one of his financial backers. He tried also to bring about an understanding between Almagro and Pizarro, but died in Cuzco without fulfilling his desire.

ESPIRITO SANTO, â-spē'rê-tụ sän'tụ (Portug.). A maritime state of Brazil, bounded by the state of Bahia on the north, the Atlantic Ocean on the east, the state of Rio de Janeiro on the south, and Minas Geraes on the west (Map: Brazil, N., J 7). Its area is 17,310 square miles. The Sierra dos Aimorés marks the western border. The coast is generally swampy, but to the south there are precipitous cliffs. The interior is generally mountainous, with elevations reaching 7000 feet. The main river is the navigable Rio Doce, which divides the state into two equal parts. All the streams are well supplied with fish. There is but one good harbor, that of Espirito Santo. The tropical climate is tempered by the proximity of the sea, the mountains, and the extensive forests.

The soil is very fertile. Sugar cane and coffee are chiefly grown, cotton and rice receiving some attention. There is one cotton mill in the state. The principal export is coffee, which is all shipped from Victoria (q.v.), the capital and practically the only port. The forests furnish costly woods and rare drugs. There are wild stretches of land, lying for the most part in the north, little explored as yet, and inhabited by Indians. Fishing is a leading occupation. Deposits of marble and lime have been found, but there is no mining. Stock raising is neglected. Espirito Santo has four representatives in the national Chamber of Deputies. There are in the state about 50 miles of railway.

Pop., 1890, 135,997; 1900, 209,783; 1913, 430,000. There are several German settlements. Though the state is liberal in its supply of funds for public schools, the percentage of children receiving instruction is low, and the inhabitants have little education. The shores of Espirito Santo were first visited by the Portuguese in 1535.

ESPOUS'AL (OF. *espousailles*, Fr. *épousailles*, from Lat. *sponsalia*, betrothal, pl. of *sponsalis*, bridal, from *sponsa*, bride, from *spondere*, to pledge). A ceremony of betrothal preparatory to marriage. 1. Among the Jews the first advances suggesting betrothal or engagement were generally on the part of the young man's parents (Gen. xxxiv. 6, 24); sometimes, however, the young man himself suggested the union (Judg. xiv. 2). The proposition was accompanied by the giving of gifts, and, when both parties agreed, the groom's parents gave a dowry to the bride's family. Originally this was the property of the family, but later it became the property of the bride to provide for her future in case of forced divorce or the death of her husband. From the time of betrothal any breach of chastity on the part of the bride meant death, and in general the same rules applied as if the marriage had already been celebrated. There was no definite period after betrothal when the marriage took place. In later times the right of choosing was given to the individuals concerned in the marriage, but even then the form of betrothal was still binding. 2. In the early Christian Church also a ceremony of espousal preceded marriage. The preliminaries consisted in a mutual agreement between the parties that the marriage should take place within a limited time, confirmed by certain donations as the earnest of marriage, and attested by a sufficient number of witnesses. The free consent of parties contracting marriage was required by the old Roman law and by the Code of Justinian. The gifts bestowed were publicly recorded. The dowry settled on the bride was stipulated in public instruments under hand and seal. The ring was given at the betrothal rather than at the actual marriage. The use of the marriage ring dates from very early times, and its recognized place was then as now on the woman's fourth finger. The witnesses present, friends of both parties, were usually 10 in number. The espousal, as incorporated with the wedding rite, is plainly traceable in the usage of the Roman, Anglican, and other churches of the present day. Consult Mielziner, *The Jewish Law of Marriage and Divorce* (Cincinnati, 1884).

ESPRIT DES LOIS, â'sprē' dâ lwä. See MONTESQUIEU.

ESPRITS FORTS, â'sprē' fôr (Fr., bold spirits). The name assumed by the French school of writers termed freethinkers (q.v.) in England and including Voltaire, Diderot, Helvétius, D'Alembert, and their contemporaries. While the English freethinkers aimed at securing merely freedom of religious speculation, and did not seek the violent substitution of a system based upon their own views for the existing order, the French *esprits forts* held a distinctly aggressive position outside of all religious confessions, vigorously opposed the despotism of church as well as of state, and were propagandists of the most radical sort. Skeptical of the value of human feeling as a guide, they desired the authority of pure reason alone to be recognized and the supremacy of the intellect to be everywhere acknowledged. Their influence was extensively felt, and many of the doctrines which they inculcated bore both good and evil fruit in the following century.

ESPRONCEDA Y LARA, ās′prôn-thā′dȧ ē lä′rȧ, José Ignacio Javier Oriol Encarnación de (1808–42). A Spanish poet, born at, or near, Almendralejo, Estremadura. At 14, Espronceda was already noted for his verses and had joined a secret society; and shortly thereafter he was sent to the Franciscan convent at Guadalajara for five years of seclusion as a revolutionist. He fought in Paris in the revolution of 1830 and afterward in the struggle for Polish liberty. Taking advantage of the amnesty of 1833, he returned to Spain, obtained a commission in the Queen's Guards, was sent to The Hague in 1840 as Secretary of Legation, and in 1842 was elected deputy from Almeria; but he was frequently in political and official disfavor, for his republican spirit kept him involved in plots, only ceasing with his early death. Espronceda is called the Spanish Byron, and he has also been compared to Victor Hugo, but has neither his force nor originality. He stood for the ardent, eager, revolutionary young Spain of his day, and his odes reflect that spirit. No lyric poet of his country has surpassed him in these. While in seclusion at Guadalajara, he began his epic poem *El Pelayo*. Later he wrote a part of another narrative poem, *El diablo mundo* (1841), dealing with the Faust legend; a novel, *Don Sancho Saldaña* (1834); and a fantastic romance, *El estudiante de Salamanca*, a variation of the Don Juan legend. A complete edition of his works, *Obras poéticas y escritos en prosa*, was prepared in 1884 by his daughter, Doña Blanca de Espronceda de Escosura, with much material hitherto unedited. The second volume has not been published. Consult also: E. Rodríguez Solís, *Espronceda: su tiempo, su vida, y sus obras* (Madrid, 1883); the excellent works by Philip H. Churchman, "Espronceda's Blanca de Borbón" and "More Inedita," in the *Revue Hispanique*, vol. xvii, pp. 549–777 (1907), "An Espronceda Bibliography," in the *Revue Hispanique*, vol. xviii, pp. 741–773 (1907), and "Byron and Espronceda," in the *Revue Hispanique*, vol. xx, pp. 1–210 (1909); A. Bonilla y San Martín, "El Pensamiento de Espronceda," in the *España Moderna*, vol. ccxxxiv, pp. 69–101 (1908); J. Fitzmaurice-Kelly, in the *Modern Language Review*, vol. iv, pp. 20–39 (1908); J. Cascales y Múñoz, "Apuntes y materiales para la biografía de Espronceda," in the *Revue Hispanique*, vol. xxiii, pp. 1–108 (1910).

ES′PY, James Pollard (1785–1860). An American meteorologist, the founder of modern physical or theoretical meteorology. He was born in Westmoreland Co., Pa., graduated in 1808 at the Transylvania University, Lexington, Ky., studied law at Xenia, Ohio, and was principal of the academy at Cumberland, Md., from 1812 to 1817. He then became professor of languages in the classical department of the Franklin Institute of Philadelphia, where he remained until about 1853, when he resigned in order to devote himself wholly to meteorological lectures and investigations. His memoir of 1836 on the theory of storms gained for him the Magellanic prize. In 1840 he visited England and France and discussed his theories in person before the British Association and the French Academy of Sciences. Espy's convection theory was based on sound physical principles, but his ideas on the mechanics of storms are not borne out by observed facts. Redfield supported the now generally accepted rotary theory of the mechanism sometimes set in action by convection. In 1841 Espy returned and published his *Philosophy of Storms*. In 1842 the United States Congress appointed him meteorologist to the War Department, where he established a service of daily weather observations, compiled daily weather maps, traced the progress and development of storms, and submitted, in October, 1843, a first annual report containing a great body of facts. He was subsequently appointed meteorologist to the Navy Department. In 1852 he was ordered by Congress to continue his researches in connection with the Smithsonian Institution, which had already undertaken the collection of meteorological data. To Espy are due the stimulus and the knowledge that made the present United States Weather Bureau a possibility. An appreciative sketch will be found in *Appleton's Popular Science Monthly* for April, 1889. Consult also *Monthly Weather Review*, vol. xxxv (Washington, 1907).

ESQUILACHE, ā′skā-lä′chā, Don Francisco de Borja y Aragón, Príncipe de (c.1581–1658); known also as Francisco de Borja y Acevedo. A Spanish poet, born in Madrid. He was Viceroy of Peru from 1614 until 1621, and the remainder of his life was spent at the court of Madrid. He is the author of the sacred poem *La pasión de Nuestro Señor* (1638); an epic poem in honor of the conquest of Naples, *Nápoles recuperada* (Saragossa, 1651); and a translation of Thomas à Kempis (Brussels, 1661). Several editions of his poems have been published under the title *Obras en verso* (1639–48, 1654–63). Selections of his works are to be found in the *Biblioteca de Autores Españoles*, vols. xvi, xxix, xlii, and lxi.

ES′QUILINE HILL (Lat. *Esquilinus Mons*). The highest of the seven hills of Rome (246 feet), standing between the Viminal and the Cælian and east of the Palatine. It has two spurs, Mons Oppius and Mons Cispius, on the former of which stands the church of San Pietro in Vincoli, on the latter Santa Maria Maggiore. Its unsanitary condition in early times was remedied under Augustus by Mæcenas, who buried a whole section under a layer of fresh earth 25 feet deep and laid out on it the pleasure grounds known as the Gardens of Mæcenas (q.v.). The Esquiline under the Empire became a fashionable residence section. On it stood the houses of Vergil, Horace, Mæcenas, and Propertius, and also the baths of Titus. Nero's Golden House covered much of the Esquiline. Many ruins of ancient edifices have been uncovered, but at once destroyed, in the course of modern building operations, and the district now forms an entirely new quarter of the city. Consult Platner, *The Topography and Monuments of Ancient Rome* (2d ed., New York, 1911).

ESQUILINUS MONS. See Esquiline Hill.

ESQUIMALT, ĕs-kwī′mạlt. A naval and military station near Victoria, B. C., Canada, on Vancouver Island and the Strait of San Juan de Fuca (Map: British Columbia, D 5), and on the Esquimalt and Nanaimo Railway. The industries include a salmon cannery, shipbuilding, a limekiln, oyster beds, a barrel factory, and a tile and sewer-pipe factory. Esquimalt has an excellent harbor and was for a time the headquarters of the British Pacific squadron; it also has a navy yard, graving dock, barracks, arsenal, meteorological station, and hospital. It is connected with Victoria by an electric railway. It has strong fortifications, manned by Canadian troops, the British garrison having been withdrawn in 1906. In 1910 the dry dock was transferred by the British Admiralty to the Canadian government. Four warships were stationed here, also a school of coast-defense artillery. Pop., 1914, about 250, exclusive of military and naval forces.

ESQUIMAUX. See Eskimo.

ESQUIRE (OF. *escuyer*, Sp. *scudero*, It. *scudiero*, ML. *scutarius*, shield bearer, from Lat. *scutum*, shield). In chivalry, the shield bearer or armor bearer of the knight to whom he was an apprentice while learning the use of arms. (See Chivalry.) The title is at present given, in England and in some parts of the United States, to all persons supposed to be in easy circumstances, excluding manual laborers and small shopkeepers. Although the title of esquire is now used with little discrimination, the following seem to be those whose claim to it stands on the ground either of legal right or of long-established courtesy: esquires by birth—(1) all the untitled sons of noblemen; (2) the eldest sons of knights and baronets; (3) the sons of the younger sons of dukes and marquises, and their eldest sons. There are also esquires by profession, whose rank does not descend to their children; and esquires by office, e.g., justices of the peace, who enjoy the title only during their tenure of office. The creation of esquires by letters patent or investiture long ago ceased.

ESQUIROL, â'skê'rôl', Jean Etienne Dominique (1772–1840). A celebrated French alienist, born at Toulouse. He served in the military lazaretto at Narbonne in 1794, obtained his degree of M.D. in 1805, and was appointed physician to the Salpêtrière at Paris in 1811. After 1817 he delivered clinical lectures on the diseases affecting the mind and their cures; in 1818 he secured the appointment of a commission, of which he became a member, for the remedy of abuses in insane asylums; in 1823 he became inspector general of the University, and in 1825 first physician to the Maison des Aliénés. He was at the same time principal physician of the private insane asylum at Charenton, which he had organized. During the July revolution he lost all his public offices and withdrew into private life. By his humane treatment of the insane he often effected cures. His writings embrace all the questions connected with the treatment of insanity. Esquirol paid great attention to the construction of suitable buildings for the insane; and most of the modern insane asylums in France, such as those of Rouen and Montpellier, have been built according to his directions. His most important works are *Des illusions chez les aliénés* (1832; Eng. trans. by Liddell, 1833) and *Des maladies mentales considérées sous les rapports médical, hygiénique, et médico-légal* (1838).

ESQUIROS, â'skê'rōs', Alphonse Henri (1812–76). A French poet, romancer, radical politician, and anti-Catholic agitator, born in Paris. He was imprisoned and confined for his *Evangile du peuple* (1840) and exiled for his political activity after Napoleon's coup d'état (1851). He was one of the few legislators who dared to vote against the war with Germany (1870). He held office under the Government of National Defense (1870), was suspended by Gambetta, elected deputy in 1871, and senator in 1876, as *démocrate-socialiste*. His political works are: *Paris, ou les sciences, les institutions, et les mœurs au XIXe siècle* (1847); *Histoire des Montagnards* (1847); *L'Angleterre et la vie anglaise* (1859–70); *La Néerlande et la vie hollandaise* (1859). In English he published *Religious Life in England* (1867). His poetry appeared under the titles *Les hirondelles* (1834); *Chants d'un prisonnier* (1841). To fiction he contributed *Le magicien* (1837) and *Charlotte Corday* (1840). Socialistically ethical are *La vie future au point de vue socialiste* (1857) and *La morale universelle* (1859).

ESQUIVEL, â'skê-vēl', Juan de (c.1470–c.1519). A Spanish soldier. In 1502 he accompanied the expedition of Ovando, who was appointed to succeed Bobadilla as Governor of Hispaniola. He was sent by Ovando in 1504 to subjugate the Indians of the Province of Higuey, then led in revolt by the cacique Cotabanamá. In 1509 he was dispatched by Diego Columbus to conquer the island of Jamaica and establish a colony there. He soon accomplished the submission of the Indians and founded the town of Sevilla Nueva. During his few years of rule the colony, through his wisdom and moderation, attained to great prosperity.

ESS, ĕs, Van. The name of two Benedictine monks, cousins, distinguished as Roman Catholics of the Liberal school.—The elder, Karl van Ess (1770–1824), was born at Warburg, Westphalia, Sept. 25, 1770. He entered the Benedictine monastery of Huysburg, near Halberstadt, in 1788, became prior of the cloister in 1801, and episcopal commissary in 1811. He died Oct. 22, 1824. With his cousin he prepared a German translation of the Bible and made a revision of the Osnabrück song book. He advocated the use of the German language in the liturgy.—Johann Heinrich van Ess, better known by his romantic name of Leander (1772–1847), was born at Warburg, Feb. 15, 1772. He was educated at the Dominican gymnasium of Warburg, and joined the Benedictine monastery of Marienmünster at Paderborn in 1790. He was ordained priest in 1796, was pastor at Schwalenburg till 1812, and professor of theology in the Marburg Seminary until 1822. He then retired to private life and devoted himself to the translation of the Bible and the circulation of the Scriptures in the vernacular. His work was disapproved by the Catholic authorities, and he defended himself in several publications. He was for a time connected with the Catholic Bible Society of Regensburg, then was agent of the British Bible Society. In 1807 he published a German translation of the New Testament, the circulation of which was forbidden by the Pope. It is the version now circulated by the Württemberg Bible Society among Roman Catholics. His translation of the entire Bible was completed in 1840. He also prepared editions of the Septuagint and the Vulgate and the Greek New Testament. He died at Affolderbach, in the Odenwald, Oct. 13, 1847. Van Ess possessed a valuable library, which was purchased after his death for the Union Theological Seminary of New York.

ESSAAD EFFENDI, ĕs'säd ĕf-fĕn'dê, Mohammed (1790–1848). A Turkish historian, born in Constantinople in 1790. He was surnamed Sahaf-Zadeh, 'son of the bookbinder,' from his father's occupation. He was historiographer of the Ottoman Empire, superintendent of the official journal of the Empire, and Ambassador to Persia. A portion of one of his works has been translated into French and edited by Caussin de

Perceval under the title *Précis historique de la destruction du corps des Janissaires* (Paris, 1833).

ESSAD TOPTANI, ĕs′sȧd tŏp-tä′nē, Pasha (c.1863-1920). An Albanian soldier and national leader, a member of the Toptani family of Tirana, near Durazzo. He was trained for the army, served in the garrisons of Macedonia and Anatolia, and finally commanded the gendarmerie at Constantinople. For his services in the war against Greece in 1897 he was granted the title of Pasha. Although he killed the agent who had been directed by Sultan Abdul Hamid to murder his brother, Ghani Toptani, his influence was so great that Abdul Hamid dared not punish him. Instead, he was transferred to Janina, where he commanded the local gendarmerie and was even raised to the rank of general. Out of hatred for Abdul Hamid, Essad joined the Young Turk movement in 1908, marched with the Saloniki troops to vindicate the constitution, and was head of the deputation that bore the news of his deposition to Abdul Hamid. During the Balkan War, Essad participated in the defense of Scutari against the Montenegrins in 1912; and when the Powers declared in favor of the autonomy of Albania, he raised the Albanian flag over his troops. Shortly after this incident the Turkish commander, Hassan Riza Pasha, was murdered, thus leaving Essad in full command at Scutari. In 1913 he was a member of the provisional Albanian government, and in 1914 he was appointed Minister of War and of the Interior. While on a visit to Italy and Austria in 1914, he was honored with the cross of the Order of the Crown of Italy and the grand cross of the Order of Francis Joseph.

ES′SAY. Unlike other literary forms, as the epic, the novel, and the drama, the essay was the invention of an individual, not the climax of a long process of growth and development. It sprang complete from the pen of Montaigne in the sixteenth century; and Montaigne still remains the most illustrious of essayists. Passages in classical literature may be cited which bear a certain relation to this form, and Bacon called the epistles of Seneca "essays," but none of these writings were in any real sense related ancestrally to the modern essay. As contrasted, e.g., with the novel, the essay according to Montaigne is brief and structurally free in form or formless. The name originally chosen for it suggests certain characteristics which distinguish it now as clearly as they did in the day of its origin. As the word "essay"—from the French *essai*, experiment; the Latin, *exagium*, a weighing, from *exigere*, to examine—indicates, this form was a new literary experiment; it approached its theme tentatively rather than in the manner of sustained argument and final exposition; it was a sally into, rather than a complete conquest of, the chosen subject. In Montaigne's hands it was chatty, informal, intimately personal, rambling, familiar, presupposing a single friendly listener. It was, too, the flower of ripe culture and experience; it left behind it a sense of overflow, as from deep springs of humane wisdom. Such was the familiar essay as practiced by Montaigne, and such substantially, in both form and manner, it remains to-day, at least in one of its two developments.

France was late in producing successors to Montaigne. The second practitioner of this literary form was an Englishman, Francis Bacon, after Montaigne perhaps the greatest of essayists.. His essays first appeared in 1597, 17 years after the appearance of the *Essais* of the great Frenchman. In Bacon the characteristics of the new literary genre are substantially the same as in Montaigne; his essays are brief and formless and informal—pithy jottings drawn about a topic as steel fragments about a magnet; without unity, the end forgetting the beginning; confidential and intimate, though with a grave confidence and a stately intimacy; suggestive beyond anything in modern literature, yet without pretext of organic structure or the orderly conduct of thought to a logical conclusion. If Bacon's essays lack the grace, abandon, flow, and perfect ease of their predecessors, they still conform essentially to the Montaigne type.

After Bacon the seventeenth century saw little or nothing of the true essay. The form was often approached, though rarely achieved, in tracts, news-letters, pamphlets, and the like. In 1600, however, William Cornwallis published papers which, however negligible from the literary point of view, were still in kind essays, and in 1668 Abraham Cowley, beloved of Charles Lamb, put forth *Several Discourses by Way of Essays* which are truly akin to the essays of Montaigne. In the year just named also appeared Dryden's *Essay on Dramatic Poesy*, which, in dialogue though it be, may be taken as typical of a kind of writing different enough from the essays of the first French and English practitioners of the art, and yet retaining traits in common with them. Dryden's *Essay* is longer than the pioneers in this genre were wont to make theirs. In place of formlessness there is careful and logical structure, while the confidential manner that engaged, flattered, and held the attention of the reader gives place to the literary tone and deportment proper to an academic forum. On the other hand, Dryden's *Essay* is brief as compared with dissertation or treatise; it absolves itself from the duty of full and exhaustive demonstration; and, however carefully and logically composed, it insists upon maintaining a modest, unpretentious, and tentative air. Thus, early in its history, the word "essay" was accepted—and still is—as referring ambiguously and indifferently either to the familiar essay as practiced by Montaigne and those in his tradition—the brief, formless, personal, intimate essay; or to the longer, more logical, less personal, and more formal type, of which Dryden's *Essay on Dramatic Poesy* is representative. After Dryden there is little to detain the student of the essay until he reaches the opening years of the eighteenth century, a period voluminous in this kind of literature. In the first decade of that century Addison and Steele began to offer a world that has never yet tired of them their delightful papers, ingratiatingly confidential, familiar but well bred, and full of pleasantness and humor. In this light, debonair, and graceful form the essays of the *Tatler* and the *Spectator* gathered up the floating talk and gossip of society, the clubs, and the coffeehouses; moralized the material; and offered it again to the public fresher and more entertaining than at first, and a most wholesome and grateful literary diet for the classes to whom it appealed. Of the unnumbered essays of the time—some 200 periodicals chiefly composed of essays are said to have sprung up—comparatively few survived. Conspicuous among these are many essays of Swift, which live with a vitality that time will hardly sap, and are published afresh for each succeeding generation. After the *Tatler* and the *Spectator*, however, the essay tended to become heavily moral and dully didactic. But the second half of the eighteenth century was to introduce one worthy successor to the *Spectator* writers in Oliver Goldsmith, whose miscellanies offer many charming essays, essentially of the familiar type. Contemporary with Goldsmith was Dr. Johnson, who in the *Rambler* and elsewhere wrote heavy-handed imitations of the successes of an earlier generation. By the end of the eighteenth century the essay was practically dead.

In the early nineteenth century came Charles Lamb to breathe a new life into the form and to win for himself a place as a prince of essayists, in some respects quite unsurpassed in the history of the art. He tossed aside the pomposity and the complacent grandiosity of Dr. Johnson, and therewith every shred of classical stiffness that may have clung about Addison, and stood forth a familiar essayist par excellence; free to be his whimsical self; culling from the English literature of the preclassical period whatever in diction, phrase, or imagery struck him as quaint, piquant, and racy; formless in his writings as he chose to be, yet binding, as by some invisible chain of mood or sentiment, seemingly rambling essays into a satisfying unity and harmony. Once more in his work the essay justifies itself as for certain types of mind an incomparable vehicle of self-expression. While Lamb was writing, essays with a distinctive charm and flavor were coming from the pen of a lesser literary light, Leigh Hunt.

With the first quarter of the nineteenth century, there came, too, a remarkable development of the formal essay, literary and other. *The Edinburgh Review*, *Blackwood's*, and *Fraser's* assembled a notable group of essayists. At this time, Hazlitt, Jeffrey, and De Quincey were active, and in 1825 Macaulay published his earliest essay, "Milton." Then, too, began to appear the masterly essays of Carlyle. With these men and others the formal essay reached its full bloom, becoming more varied and elaborate than ever before—critical, controversial, contentious, philosophical, or scientific, and yet retaining such distinctive traits of the form as comparative brevity, a tentative and suggestive, rather than a complete and final, aim, and an air more freely personal, whimsical, and idiosyncratic than would have become more extended and pretentious works. The growing vogue of periodical literature at this time insured the essayist a wide hearing and opened a market for him; and the essay forthwith became increasingly a favorite form for independent thinkers who desired to offer experimentally new theories or to present some observation in art, literature, history, or science, dealing thus at first cursorily and suggestively with data to be embodied later, perhaps, in bulky tomes of sustained logic and masses of ordered facts—witness Spencer's *Synthetic Philosophy* or Darwin's *Origin of Species*. From the days of Charles Lamb to the present, English literature has never lacked distinguished practitioners of the art of essay writing in its two branches of the familiar and the formal essay, as the names of Arnold, Pater, Lang, Stevenson, Dobson, Gosse, Saintsbury, and Arthur Christopher Benson variously and sufficiently attest.

American writers, as essayists, hold an honorable place, with the mellow and genial essays of Washington Irving initiating the familiar, and those of Poe early representing the more formal, type. To Emerson's genius the form was precisely suited, and he produced a body of writing in this kind highly distinguished by originality, richness of thought, and a serene and lofty temper. Lowell blended the two types in work likely long to prove informing and, thanks to the robust and attractive personality that is a part of it, delightful. And so, on to this day of William Dean Howells, George Edward Woodberry, and Paul Elmer More, the essay stands a substantial asset to the credit of American literature.

In the country of its origin the essay was, as has been said, long a well-nigh unpracticed form. Certain writings of Voltaire, of Diderot, and of others might pass on the whole as essays, Voltaire, indeed, making free of the word in entitling his *Essai sur les mœurs;* but Voltaire surely would not have claimed, nor would Locke in the case of his *Essay Concerning Human Understanding*, that the work in question had anything in common with the essay proper save in its tentative and experimental nature. There appeared, however, about the middle of the nineteenth century, a great French essayist who produced through a prolific literary career an imposing array of essays of prime quality. The reference is of course to Sainte-Beuve. This accomplished writer knew how to blend the appealing personal note of the intimate essay with a wealth of ordered thought and a scholar's store of precise knowledge, which, together with a wonderful literary faculty, resulted in his splendid series of studies and portraits, warmed as if by the spirit of life itself, and of the most varied and alluring interest. From Sainte-Beuve's day, uncounted French essayists, many of them artists, scholars, and thinkers, and some of them all three in one, have brought forth unceasingly works in this kind which are part of the literary glory of France and a perennial delight to readers the world over. The tradition of the French essay was ably upheld to the end of the last century and beyond by such men as Gautier, Brunetière, Anatole France, Jules Lemaître, and Emile Faguet.

ESSAY CONCERNING HUMAN UNDERSTANDING. A famous philosophical work by John Locke (1690).

ESSAY ON CRITICISM, AN. A didactic poem by Alexander Pope (1711), laying down the canons of poetic taste and verse structure. The poem abounds in passages which have become familiar quotations.

ESSAY ON MAN, AN. A noted philosophical and deistic poem by Alexander Pope, in four parts, which appeared from 1732 to 1734, inspired by the metaphysical vagaries of Bolingbroke.

ES'SAYS AND REVIEWS. The title of a volume of essays published in 1860, by six clergymen and one layman of the Church of England—Dr. Frederick Temple, Dr. Rowland Williams, Prof. Baden Powell, H. B. Wilson, Mark Pattison, Prof. B. Jowett, and C. W. Goodwin. The book, which was severely censured for heterodox views by nearly all the bishops and many of the clergy, was condemned by convocation in 1864. The ecclesiastical courts sentenced Dr. Williams and Mr. Wilson to suspension for one year; but on appeal the sentence was reversed by the Privy Council.

The most remarkable among the works put forth in opposition were the *Aids to Faith*, edited by Bishop Thomson, and *Replies to Essays and Reviews*, edited by Bishop Wilberforce.

ES'SEG. See Eszék.

ESSEN, ĕs'sen. A town in the Prussian Rhine Province, situated between the Ruhr and the Emscher, 20 miles northeast of Düsseldorf (Map: Prussia, B 3). The town is substantially built, with clean, well-laid-out streets. The cathedral, founded in 873, is one of the oldest churches in Germany. Its treasury contains some valuable works of art. Among modern secular buildings are the Gothic Rathaus, in front of which stands a statue of Alfred Krupp, the new courthouse, and the Municipal Theatre. The town's affairs are administered by a municipal council of 36 and an executive board of eight members. It has a modern sewage system, an excellent water supply, municipal gas works, and an abattoir. Its educational institutions include a gymnasium, a high school for girls, several mechanical and industrial schools, a school of mines, and a royal agricultural school. Situated in the centre of one of the richest coal and iron regions of Germany, Essen has excellent facilities for an extensive iron industry. First among the industrial establishments are the famous Krupp steel and iron works, which employ more than 43,000 men. There are also a number of smelters, boiler works, manufactories of walking sticks, dyestuffs, bricks, and liqueurs. In 1911 the chambers of commerce of Essen and Mulheim-Oberhausen were united in a single body with headquarters at Essen. Essen has good railway facilities and an electric street railway. It is the seat of a United States consular agency. The borough of Rüttenschied was taken into the city limits in 1905, and the commune Huttrop in 1908. Pop., 1900, 118,863; 1910, 294,653. Although the industrial activity of Essen is only of recent growth, the town itself is very old, tracing its origin to the famous Benedictine nunnery of the same name, founded in 873 A.D. In the tenth century it was given municipal privileges by the Abbess Hagona. It was taken by the Spanish and the Dutch in the seventeenth century, and was annexed to Prussia in 1813. Consult Kellen, *Die Industriestadt Essen in Wort und Bild* (Essen, 1902), and Zweigert, *Die Verwaltung der Stadt Essen im 19. Jahrhundert* (Essen, 1902).

ESSEN, Hans Henrik, Count (1755–1824). A Swedish statesman, born at Kaiås, West Gotland. He was educated in the State University at Upsala, then entered the army, becoming a cornet at 18, and accompanied Gustavus III in his travels and campaigns. He became Governor of Stockholm in 1795, and Governor-General of Swedish Pomerania and Rügen in 1800, and in 1807, as commander of the Pomeranian army, distinguished himself by his defense of Stralsund against the French. Upon the revolution of 1809 he received the title of count and a place in the Council of State. In 1810 he was sent as Ambassador to Paris by Charles XIII, and his negotiations with Napoleon's ministers restored Pomerania to Sweden. He was promoted field marshal in 1811; was sent against Norway (1813) and was Governor of that country (1814–16) after its union with Sweden, and in 1817 became Governor-General of Skåne, an old province in southern Sweden. Consult the biography (Malmö, 1855) by Wieselgren.

ES'SENCE (Lat. *essentia*, existence, from *esse*, to be). In logic, that which is included in the logical definition (q.v.) and is opposed to accidents. But as definitions are based upon classifications into genus and species, and as there is no single absolute objective classification, but all our classifications are controlled by some prevailing interest, which selects what is relevant to its purpose, it follows that what is essence according to one classification is accident according to another. The essential in logic as in life is what a particular purpose demands. In metaphysics essence is sometimes used as equivalent to substance (q.v.). In theology, Athanasius and other Greek writers distinguish *οὐσία*, *ousia* (essence or substance), denoting what is common to the Father, Son, and Holy Spirit, from *ὑπόστασις*, *hypostasis* (person), denoting what is individual, distinctive, and peculiar to each person.

ESSENCE DE PETIT GRAIN, ĕs'säɴs' de pe-tē' grăɴ (Fr., essence of small grain). A perfume obtained by the distillation of small, unripe oranges, about the size of a cherry.

ES'SENCES. See Spirits.

ESSENES, ĕs-sēnz'. A Jewish brotherhood, whose origin can be traced back to the second century B.C., and which ceased to exist in the second century A.D. They first appear in history during the early period of the Maccabæan uprising and were doubtless an expression of the general tendency towards religious separatism characteristic of that time. The derivation of the name is doubtful. Its source may perhaps lie in the Aramic *ḥesē*, through the plural absolute *ḥesēn*, or the emphatic *ḥesayyā* (pious) which would correspond to the two Greek names most largely used to designate the order, *Ἐσσηνοί*, *Essēnoi*, and *Ἐσσαῖοι*, *Essaioi*. As an organization it was confined to Palestine, having its chief, if not its only, settlements on the shores of the Dead Sea, though it represented tendencies of thought and life which were generally prevalent in that time and consequently manifested themselves in many regions, especially where Judaism was present. Many of the order resided in the villages and even in the larger towns and cities of Palestine, which was not inconsistent with their principles, though seclusion was more congenial to their manner of life.

Information regarding the order is meagre, being practically confined to that received from the elder Pliny, Josephus, and Philo, who alone speak of the Essenes from personal knowledge. No mention is made of them in the Bible or in Rabbinical literature. From these sources we learn that their most distinctive features were the strictness of their organization, their intense regard for ceremonial purity, including hyper-Sabbatarianism, and their practice of the community of goods. A probation of one year was required before the novice could be admitted to the lustrations, and a further probation of two years before he could obtain entrance to the common meal and take the oath of full membership. This oath demanded absolute obedience and secrecy, and when broken was punished by an expulsion that, because of the continuance of the binding requirement that no food should be taken which was ceremonially unclean, was equivalent to death by starvation. As regards their ceremonial purity, the special points of insistence were abstinence from sexual intercourse,—though there were some, constituting, according to Josephus (*Wars*, II, viii, 13), a different order within the society who married—innumerable washings, scrupulous bodily cleanliness, the avoidance of contact with lower orders in the brotherhood, the exclusive wearing of white raiment, and particularly the peculiar ceremonial requirements of their common meal, to which none but full members of the order were admitted, the food of which was specially prepared by their priests, and the whole conduct of which partook of the nature of a sacrificial feast. As communists, all possessions and all rewards of labor were held in common and distributed according to need. The chief employment of the brotherhood was agriculture, though handicrafts of all kinds were carried on—the only prohibition being trading, as leading to covetousness, and the manufacture of weapons and instruments which might injure men, as being against their fundamental principle of peace, though some members of the order were found among the leaders and the fanatic followers in the Jewish War. As a society they were the first in history to condemn slavery, in practice as well as in theory, as violating the brotherhood of man.

The order had its chief roots in Judaism, its struggle after ceremonial purity showing it to be a refinement of Pharisaism. At the same time it had elements so strongly at variance with Judaism in general, and Pharisaism in particular, as to suggest influences foreign to Palestine. These elements were especially the rejection of animal sacrifices, by which its members were excluded from the temple worship; the peculiar attention to the sun, which was considered as representing the divine brightness, the members praying towards it at its rising and avoiding all uncovering of themselves before it; and especially the view entertained regarding the origin, present state, and future destiny of the soul, which was held to be preexistent, being entrapped in the body as in a prison and having before it, as a reward of righteousness, a blessed paradise in the farthest west, and, as a penalty of iniquity, a dark and gloomy cavern full of unending punishments. As to what these foreign influences were, there is considerable discussion, in which perhaps no conclusions can be reached beyond the general one that they were Oriental, rather than Greek, gathering around an essential dualism whose influence can be traced in other peculiarities of the order's belief and custom. This is confirmed by the fact that Oriental influences were prevalent in the West from the third century B.C. to the third century A.D., within which time Essenism flourished.

It is an interesting question as to how much Christianity owed to Essenism. It would seem that there was room for definite contact between John the Baptist and this brotherhood. His time of preparation was spent in the wilderness near the Dead Sea; his preaching of righteousness towards God, and justice towards one's fellowmen, was in agreement with the propaganda of Essenism; while his insistence on baptism was in accord with the Essenic emphasis on lustrations. But the Baptist was much more of an ascetic than an Essene would have needed to be, and had a Messianic outlook, which does not seem to have entered into the Essenic belief. Doubtless the fundamental teachings of Essenism—love to God, to virtue, and to fellowmen—which also existed in Judaism outside Essenic circles, had vital agreement with the precepts of Christianity; so that from this element in Judaism in general Christianity may have taken many of its earlier converts, while it is more than probable that Christianity's world-wide development of these common ideals did as much as anything to prepare Essenism for its final disappearance as a distinctive organization.

Bibliography. A large literature has been produced on this subject. Among the later books, consult: Lightfoot, "Excursus," in *Commentary on Colossians and Philemon* (3d ed., London, 1879); Schürer, *Geschichte des Jüdischen Volkes zur Zeit Jesu* (3d ed., 3 vols., Leipzig, 1898–1901); Friedländer, *Die Religiösen Bewegungen Innerhalb des Judenthums im Zeitalter Jesu* (Berlin, 1905); Bousset, *Religion des Judentums* (2te Aufl., Berlin, 1906); Pfleiderer, *Primitive Christianity* (Eng. trans., New York, 1906); Fairweather, *The Background of the Gospels* (ib., 1908). Also the article by Moffatt, in *Encycl. of Religion and Ethics* (New York, 1912), which quotes at length the original sources. See Jewish Sects and its bibliography.

ESSEN'TIAL OIL. See Oils.

ESSENTU'KI, or Essentukskaya. A watering resort in the Territory of Terek, in the Northern Caucasus, Russia, about 10 miles northwest of Pyatigorsk (Map: Russia, F 6). It is situated at an altitude of about 2000 feet and is much frequented during the summer months because of its cold alkaline springs. Pop. (est.), 8000.

ESSEQUIBO, ĕs'se-kē'bô (native name *Dissequebe*). The largest river of British Guiana, rising about 1° north of the equator on the north slope of the Akarai Mountains, which separate its valley from that of the Amazon River (Map: Guiana, F 3). It flows in a northerly direction, emptying into the Atlantic west of Georgetown, after a course of over 600 miles. At its mouth, an estuary about 20 miles wide is formed, containing numerous islets. Its course is very tortuous and interrupted by numerous cataracts, while its mouth is closed by bars which can be passed by deep-draft vessels only during high tide. It is navigated for a considerable distance, and even heavy vessels can ascend for a distance of about 40 miles from its mouth. Its chief tributaries are the Rupununi, Potaro, and the Cuyuni-Mazaruni, all from the west. On the banks are forests of locust tree, ironwood, ebony, greenheart, and other fine timber trees. The region adjoining the river was the subject of conflicting claims between the British and Venezuelan governments, which led to the Arbitration Treaty of Feb. 2, 1897. The award was made Oct. 3, 1899. See Venezuela, *History*.

ESS'ES, Collar of. A collar composed of a series of the letter S. See SS, Collar of.

ES'SEX (AS. *East-Seaxe*, East Saxons). A maritime county in southeastern England, bounded on the north by Cambridge and Suffolk, on the east by the North Sea, on the west by the County of London and Hertford, and divided from Kent on the south by the Thames estuary (Map: England, G 5). It has 85 miles of coast line, and an area of 1530.5 square miles. On the coast the surface is low-lying and marshy, but from the centre to the north is undulating and well wooded. The chief rivers are the Lea, Roding, Roach, Blackwater, and Colne. Chalk, brick, clay, and sea salt are the chief mineral products. Wheat of excellent quality and barley are largely grown, and stock is raised for market purposes. About four-fifths of the area of the county is under cultivation. There are extensive manufactures of chemicals, railroad machinery and agricultural implements, powder, lime, silks, etc., and valuable brewing, fishing, and oyster industries. Capital, Chelmsford. Pop. (with associated county borough), 1901, 1,083,998; 1911, 1,350,881.

Essex figured prominently in early English history. At the time of Cæsar's invasion it was inhabited by the Trinobantes, of whose advanced civilization much numismatic evidence remains. The Romans thoroughly colonized the country, as is shown by relics dug up at Colchester, as well as by the Roman military road which crosses the country. When the Roman power declined the Saxons made Essex the object of their raids, finally overrunning the land and incorporating it with the domain of the Count of the Saxon Shore. After the withdrawal of the Romans, it was occupied by the East Saxons, whence its name, and became a member of the Saxon heptarchy. The East Saxons continued to be ruled by a separate dynasty until about 823, when they were absorbed by the West Saxons, which became the ruling power in England. During the struggles of Alfred the Great with the Danes, Essex was the scene of many fierce conflicts, till, by the Peace of Wedmore (879 A.D.), it was recognized by Alfred as part of the Danish territory of Guthrum. Later the Danes were driven out by Alfred's son, Edward the Elder. In 1045 Essex became part of the earldom of Harold, but at the time of the Norman Conquest it had passed into the domain of the family of Swene. Beginning with the Norman kings, and continuing to the present time, it has constituted an earldom of the crown, and has passed through several family histories.

ES'SEX. A town and railway junction of Essex County, Ontario, Canada, 15 miles southeast of Windsor, on the Michigan Central Railroad (Map: Ontario, B 9). It has electric railway connection with Kingsville, Windsor, and Leamington. The manufacturing industries include flour and planing mills, a canning factory, and brick and tile works. Natural gas is found in the vicinity. Pop., 1901, 1391; 1911, 1353.

ESSEX. A town in Middlesex Co., Conn., 31 miles (direct) southeast of Hartford, on the Connecticut River, and on the New York, New Haven and Hartford Railroad (Map: Connecticut, F 4). The town contains a public library. It has a large piano factory and a bit factory. Pop., 1900, 2530; 1910, 2745.

ESSEX. A town in Chittenden Co., Vt., 12 miles northeast of Burlington, on the Central Vermont Railroad (Map: Vermont, B 3). It contains the Essex Classical Institute. The town is situated in a purely agricultural and dairying region. Pop., 1900, 2203; 1910, 2714.

ESSEX, ARTHUR CAPEL, first EARL OF (in the Capel line) (1632-83). An English statesman. Charles II sent him to Denmark in 1659 as Ambassador in order to be rid of his opposition at home; but his conduct while there so pleased the King that upon his return in 1671 he was made Privy Councilor and in 1672 Lord Lieutenant of Ireland. He gave that country a remarkably efficient, liberal, and honest government until 1677 when, owing to the intrigues of his enemies, he was recalled. He joined the country party in England under the leadership of Halifax and in 1679 was Commissioner of the Treasury. In the following year he became a member of Shaftesbury's party which urged the exclusion of James from succession to the throne. Although he did not approve of the extreme measures of this faction he was arrested and imprisoned in 1683 in the Tower, where he was shortly afterward found with his throat cut. Consult his *Letters* with an account of his life (London, 1770; 2d ed., 1783), and *Selections from the Correspondence of Arthur Capel* (London, 1913).

ESSEX, ROBERT DEVEREUX, second EARL OF (1567-1601). An English court favorite and statesman. He was born at Netherwood, Herefordshire. Entering Trinity College, Cambridge, in 1579, he was given the degree of M.A. in 1581, and three years afterward his guardian, Lord Burghley, introduced him at court, where he became a favorite of Elizabeth. Accompanying his stepfather, the Earl of Leicester, to Holland, he distinguished himself at the battle of Zutphen. After the death of Leicester, Essex continued to rise in the favor of Elizabeth, who loaded him with honors. She gave him command of the forces sent in 1591 to assist Henry IV of France against the Spaniards; and five years afterward she appointed him joint commander with Lord Howard in the expedition against Spain. Though Essex displayed exceptional courage at the taking of Cadiz, the expedition was fruitless, so that on his return he had to defend himself against various accusations. In 1597, however, he was made Earl Marshal of England, and when Burghley died, Essex succeeded him as Chancellor of Cambridge. At the outbreak of the rebellion in 1599 he went to Ireland as Lord Lieutenant; but his government was ill-advised and ineffective, and after a few trivial undertakings he concluded with the rebels a truce for which he was regarded at court with grave misgivings. Contrary to the Queen's express commands, he hastened back to London to confront his enemies, and without changing his travel-stained garments he forcibly effected an interview with the Queen in her bedchamber. She received him kindly; but in June, 1600, he was brought to trial before a special court consisting of the principal officers of state and the judges, on charges of contempt and disobedience, and sentenced to dismissal from all offices of state and to imprisonment in his own house during the Queen's pleasure. Through the intercession of Francis Bacon his liberty was soon restored. But when he foolishly tried to excite an insurrection in London to compel Elizabeth to remove his enemies from the council, he was imprisoned, tried, and condemned to death. Elizabeth delayed signing the warrant for his execution in the hope that he would implore her pardon. He was beheaded Feb. 25, 1601, after defending himself with pride and dignity. Consult: Bacon, *Declaration of the Practises and Treasons . . . Committed by Robert, Late Earl of Essex* (London, 1601); Spedding, *Bacon*, i (ib., 1881), chief authority, should be read with the following: Abbott, *Bacon and Essex* (ib., 1877), more favorable than Spedding; Barrow, "Earl of Essex," in his *Memoirs of the Naval Worthies of Queen Elizabeth's Reign*, pp. 333-376 (ib., 1845); Birch, *Memoirs of the Reign of Queen Elizabeth* (ib., 1754); Bruce, *Correspondence of King James VI of Scotland with Sir Robert Cecil, etc.* (Westminster, 1861);

Lohmann, *Essex-Trauerspiel* (Leipzig, 1856); Croxall, *Memoirs of the Unhappy Favorite* (London, 1729); Wotton, *Characters of Robert Devereux . . . and George Villiers, etc.* (Lee Priory, 1814); Cooper, *Athenæ Cantabrigienses* (2 vols., Cambridge, 1858), for his writings.

ESSEX, ROBERT DEVEREUX, third EARL OF (1591-1646). An English general and politician. He was the son of Robert Devereux, second Earl of Essex, and in 1604 regained possession of his father's titles, which had been attainted in 1601. He was educated at Eton and Merton College, Oxford, and after the accession of James I was one of the companions of the Prince of Wales, afterward Charles I. In 1606 he was married to Frances Howard, daughter of the Duke of Suffolk, but the marriage was a loveless one, and was annulled in 1613. A second marriage was equally unfortunate. In 1621 he saw some service in the Palatinate, and two years later was vice admiral in a naval expedition against Cadiz. In 1626 he refused payment of the forced loan and joined the parliamentary opposition to Charles I, and remained faithful to the cause of popular government in spite of the many favors heaped upon him by the King, who hoped to win him over to his side. In 1639 he was lieutenant general in the army sent against the Scottish Covenanters. Three years later, after the open breach between Parliament and the King, he was made commander of the parliamentary forces. He fought the indecisive battle of Edgehill in 1642, captured Reading in the following year, and relieved Gloucester, which was besieged by Charles I. On his march from Gloucester to London he was intercepted by the royal army and fought the first battle of Newbury. In 1644 he invaded Cornwall, but met with ill success, and, owing, it is said, to his unwillingness to fight against the King in person, the greater part of his army was forced to capitulate at Lostwithiel. Before this he had become embroiled with the House of Commons, because of the appointment of other generals to independent commands in the parliamentary army, and in 1645 he took advantage of the passing of the Self-denying Ordinance to resign his commisssion.

ESSEX, THE. A United States frigate of 860 tons, in service during the War of 1812 under the command of David Porter. Farragut was a midshipman on the ship on her first expedition. She captured the *Alert* in 1812, and after operations in the Pacific surrendered to the *Phœbe* and *Cherub* in Valparaiso harbor on March 28, 1814.

ESSEX, THOMAS CROMWELL, EARL OF. See CROMWELL, THOMAS.

ESSEX, WALTER DEVEREUX, first EARL OF (in the Devereux line) (1541-76). An English adventurer. He assisted in suppressing the northern rebellion under the earls of Northumberland and Westmoreland and in 1572 was made a knight of the Garter and Earl of Essex. In the following year Queen Elizabeth accepted his offer to subdue and colonize the Province of Ulster in Ireland. After landing in that country his forces were diminished by sickness, death, and desertion to about 200 men, and he was obliged to confine his efforts to petty raids—burning the corn stacks and fields of the O'Neill clan. In 1574 he captured by treachery Sir Brian MacPhelim, leader of the O'Neills, and executed him, his wife, and his brother at Dublin. He also massacred several hundred followers, chiefly women and children, of Sorley Boy McDonnell on the Isle of Rathlin. He was recalled in 1575, but returned to Ireland in the following year as Earl Marshal.

ESSEX HOG. See HOG and Plate of HOGS.

ESSEX JUNCTION. A village in Chittenden Co., Vt., 8 miles east of Burlington, on the Central Vermont Railroad (Map: Vermont, B 3). The village contains a United States government post and Fort Ethan Allen. It is situated in a rich farming region and has a corn-canning factory, brickyards, grain and lumber mills, and a butter factory. The water works are owned by the municipality. Pop., 1900, 1141; 1910, 1245.

ESSEX JUNTO. A term used for the first time by a Colonial governor of Massachusetts to designate a body of men from Essex County, who had arrayed themselves against his policy. It was next employed by Governor Hancock in 1781, against the chief supporters of James Bowdoin, nominated for Governor as the representative of the traditional, as opposed to the popular, politics of the day. The term entered national politics about 1798, as applied opprobriously to the Federalist leaders in Massachusetts, who opposed Adams and his policy towards France. Among these were Timothy Pickering, Theophilus Parsons, Fisher Ames, George Cabot, Stephen Higginson, and the Lowells, mostly Essex County men. Adams charged that they were allied with England, but the combination seems not to have had any treasonable intent. Later these same men were prominent in opposition to the Embargo and to the War of 1812, were party chiefs of the extreme Federalists, and were prime movers of the measures which culminated in the Hartford Convention (q.v.), so that the name became a synonym for New England Federalism. Consult Lodge, *Life and Letters of George Cabot* (Boston, 1878).

ESSEX SKULL. See MAN, ANCIENT TYPES.

ESSIPOFF, ĕs'sē-pôf, ANNETTE (1851-). A Russian pianist, born in St. Petersburg. She was one of Leschetitzky's most brilliant pupils. She made her début in St. Petersburg in 1874; then entered upon artistic travels which brought her in 1876 to the United States, where her playing was greatly admired. In 1880 she married Leschetitzky, but they were divorced. From 1893 to 1908 she was professor of pianoforte at the St. Petersburg Conservatory.

ESS'LING, or **ESS'LINGEN.** A village in Lower Austria, 7 miles east of Vienna. Between it and the village of Aspern a bloody battle was fought between the French and the Austrians on May 21-22, 1809. This engagement is generally known as the battle of Aspern and Essling. See ASPERN.

ESSLINGEN, ĕs'lĭng-*en*. A town in the Kingdom of Württemberg, Germany, situated on the Neckar, in the centre of a fertile district, 7 miles east-southeast of Stuttgart (Map: Germany, C 4). The river is here crossed by a bridge constructed in the thirteenth century and restored in 1838. Esslingen consists of several suburbs, and of the inner town, which is partly surrounded by walls, dating from 1216. Three of its churches are worthy of notice: the Liebfrauenkirche, a handsome Gothic structure of the fifteenth century; the church of St. Dionysius, a basilica in the transition style, founded in the eleventh century; and that of St. Paul, in the early Gothic style, dating from 1268. In addition may be mentioned the old and the new

Rathaus and the castle of Perfried. The industries include the largest machine works in Württemberg (employing 2200 men), large railway shops, the manufacture of gold, silver, and plated ware, worsted, lithographed work, gloves, lacquer ware, gelatin, and buttons; it has also cotton mills and beer breweries. Esslingen is famous for its sparkling Neckar wine known as Esslingen champagne. Pop., 1900, 27,197; 1910, 32,364. Esslingen was founded in the eighth century, and originally belonged to the Duchy of Swabia. In 1209 it was made a free Imperial city. The Swabian League was formed at Esslingen in 1488. In 1802 the town came into the possession of Württemberg.

ES'SON, William (1838-1916). A British mathematician, educated at the Inverness Royal Academy and at St. John's College, Oxford (M.A.). From 1860 to 1897 he was a fellow of Merton College, where he served as bursar, and he was also fellow of New College. He was deputy Savilian professor at Oxford University from 1894 to 1897, and thereafter full professor. Elected a fellow of the Royal Society, he published in the society's *Transactions* "The Laws of Connection between the Conditions of Chemical Change and its Amounts" (1864, 1866, and 1895) and "Variations with Temperature of Rate of Chemical Change" (1912).

ES'SONITE. See Garnet.

ESSONNES, ĕs'sŏɴ'. A town in the Department of Seine-et-Oise, France, a suburban municipality 1 mile southwest of Corbeil, and 19 miles southeast of Paris (Map: France, N., J 3). It has iron foundries, machinery, linen, and notable paper factories. Pop. (commune), 1901, 9374; 1911, 9348.

ESTAB'LISHMENTS, Ecclesiastical. Those religious bodies which in various countries have definite legal relations to the state, involving special privileges and duties. The origin of such a connection usually dates back to a period when the inhabitants of the country were practically unanimous in their religious views. When a sovereign was moved to take definite steps in support of religion, it could naturally be only of that type of religion which was to him and his subjects the normal and recognized type. In some cases, notably that of England, the idea grew up with the country and antedates any possibility of formal legislation. In England the term "by law established" first occurs in the canons of convocation in 1604, but the relation itself was far earlier. (See England, Church of.) When, at the Reformation, the bulk of the population of any country transferred its allegiance from one religion to another, the privileges of an establishment were usually transferred in the same manner. The case of Ireland was peculiar; the connection of the Protestant church of that country with the Church of England allowed it to maintain its position as a privileged body, though in a hopeless minority, until the Disestablishment Act of 1870 was passed by Mr. Gladstone. The connection between church and state may operate in various ways—by the sovereign assuming to nominate the chief ministers of the religious body (see Gallican Church; Concordat); by taxation on the part of the state, or indirectly with its sanction, for the support of the clergy and of public worship; by a regulation of the uses of property devoted to religious purposes and of the procedure and ritual of the church; by the maintenance of ecclesiastical courts for the enforcement of canonical laws; by the provision of a system of education under ecclesiastical supervision; and in some cases by the prohibition of dissenting worship. (See Toleration; Nonconformists.) In Protestant countries the sovereign is usually considered the head of the established church; Queen Victoria used punctiliously to mark her sense of the requirements of this position by always attending the services of the Presbyterian church in Scotland and of the Anglican in England. Thus, also, in Russia, the Czar practically occupies a similar position. The restrictions upon ecclesiastical freedom inseparable from such a position have caused many devoted churchmen to feel that the advantages were more than outweighed by the drawbacks; and thus in England such men have been found, in the last 50 years, in the ranks of the advocates of disestablishment. The movement there has, however, been chiefly supported by Nonconformists of a political type, who maintain the view that the modern free state has no right to discriminate in lawful things between various classes of its subjects. The agitation became strong about 1870-80. England, Russia, Greece, Sweden, Norway, Prussia, and some other German states have established churches. (See Civil Church Law, American.) For the details of the subject applying to various countries, see the articles on those countries.

ESTAING, ĕs-tăɴ', Charles Hector, Count d' (1729-94). A French admiral. After serving in India under Lally-Tollendal and suffering imprisonment at the hands of the English, he entered the royal navy and was made lieutenant general in 1763 and vice admiral in 1777. In 1778 he commanded the fleet sent to aid the United States against Great Britain, bringing with him Gérard, the first French Ambassador to the United States. He planned with the American generals a combined land and naval attack on Newport and forced the British to burn a number of vessels in the harbor. Admiral Howe came, with an English fleet, to relieve Newport, and D'Estaing put to sea to engage him. A sudden storm separated the fleets, and D'Estaing put into Boston to repair his shattered ships. In November he sailed to the West Indies, where he captured St. Vincent and Grenada. With 22 ships he coöperated Oct. 9, 1779, in the unsuccessful attack on Savannah and was himself wounded. The following year he returned to France and was in command of the French and Spanish fleet before Cadiz when the treaty of peace was signed in 1783. He was in favor of the principles of the French Revolution in their more moderate form, and was elected to the Assembly of Notables in 1787. In 1789 he commanded the National Guard. In 1792 the Legislative Assembly chose him admiral. In 1793 he bore testimony in favor of Marie Antoinette, but without deserting his constitutional principles. The following year, in spite of his work for the Revolution, he was charged as a noble, tried, condemned, and executed, April 28, 1794. He wrote some poetry, a work on the colonies, and a tragedy, *Les Thermopyles* (1789).

ESTAMPES, ā'täɴp', or **ETAMPES**, Anne de Pisseleu, Duchesse d' (1508-c.1585). A mistress of Francis I of France. She was maid of honor to his mother, Louise of Savoy, and the King fell in love with her upon his return from Spain in 1526. In 1536 she entered into a formal marriage with Jean de Brosse and was created Duchess of Estampes. She is said to have been beautiful, witty, and highly educated, and to have exercised great influence over the King. She had a rival in Diane de Poitiers (q.v.), mistress of the Dauphin Henry, who succeeded to the throne in 1547. Political parties centred about the persons of the two women till the accession of Henry in 1547, when the Duchess was banished to her estates, became a Protestant, and lent important services to the Huguenot cause. Consult Paulin Paris, *Etudes sur François Ier* (Paris, 1885).

ESTATE (OF. *estat*, Fr. *état*, from Lat. *status*, state, condition, from *stare*, Gk. *ἱστάναι*, *histanai*, Skt. *sthā*, to stand). The technical term of the common law for property interests in land. Land is not, in our legal system, like goods and chattels, capable of absolute ownership by a subject. The feudal system, under whose influence our law of real property was developed, vested the ultimate ownership of all land in the King, all private owners being deemed to be merely tenants, holding their lands in subordination to the paramount rights of the crown. The interest of such a tenant was described as his *estate* in the land, i.e., his *status* with reference to it; and this estate, however complete and unqualified it might be, was always regarded as something less than absolute ownership, and as leaving a reversionary interest in the superior lord, some portion of the ownership undisposed of by him. The term "estate" was originally applied only to those interests in land technically known as freeholds, which were classified as real property; but it has in course of time been extended by analogy to include other interests, such as leaseholds, the interests of mortgagees, and certain creditors' rights in land, all of which are in our law classified as personal property. All of these interests have this element in common, that they exist in subordination to a paramount or underlying title, in which they may ultimately be absorbed, and which no act of the "tenant" or temporary owner can effect. This is not true, however, of most forms of personal property, as goods, etc. These are held by the owner absolutely, free from any superior proprietorship or lordship, and accordingly his ownership cannot be described as a tenancy or an estate. Hence the expression "personal estate," sometimes employed by analogy with "real estate," is, strictly speaking, inaccurately used as a substitute for "personal property."

The primary classification of estates, following the line of cleavage above indicated, is into *estates of freehold* and *estates not of freehold*. In the former are included the three great forms of freehold tenure—the fee simple, fee tail, and life estates, the two former of which are further described as estates of inheritance, and the last as an estate not of inheritance. Estates not of freehold are more commonly described simply as tenancies—as tenancies for years (leasehold estates), tenancies at will, and tenancies at sufferance—the term "estate" not being usually applied to the last two of these. Intermediate between the leasehold estate and the tenancy at will there has been developed a new form of tenure known as an estate or tenancy from year to year, which, though usually classified with the latter, shares many of the characteristics of both. All of these forms of estate will be described under their appropriate titles.

The most striking fact in connection with this classification of estates is its definiteness and rigidity. The several varieties of estates are sharply differentiated from one another. Each class has its characteristic features or incidents which mark it off distinctly from every other class, and every tenure or holding of land must conform to one or another of them. There are no intermediate estates, nor can the qualities of one be attached at will to another. No one can create a freehold which is not either a fee simple, a fee tail, or a life estate, and no one can create a fee simple which has the limited heritability of a fee tail, nor an inheritable life estate, nor a leasehold estate which shall descend to the heir instead of passing to the executor or administrator of the owner upon his death. Neither is it possible to attach novel incidents to an estate, nor, usually, to deprive it of those which belong to it. Thus, in a devise or conveyance of land to A and his heirs, a proviso that it shall be inalienable, or that the inheritance shall be confined to male heirs, will be disregarded as incompatible with the nature of a fee simple; and, there being no intermediate estate such as the one described, i.e., an inheritable estate which is inalienable or in which the inheritance is limited to males, the devise is treated as an ordinary fee simple with the usual incidents of such an estate.

Apparent exceptions to this rule are afforded by the fee-tail estate, in which inheritance is confined to the issue of the tenant, and may be still further limited to his male or his female issue, etc., and by the tenancy from year to year. But these are themselves ancient forms of tenure, and not mere variations of the fee simple and the tenancy at will from which they were respectively derived, and have long since crystallized into forms as definite and invariable as those of the older estates. While the incidents of these time-honored forms of landholding have sustained great changes through legislation and the process of judicial decision, no new forms or varieties of estate have come into existence for upward of two and one-half centuries, and no additions to the list seem likely to be made in the near future. The sporadic revival of the ancient qualified or limited fee will be referred to in connection with the fee simple (q.v.). For the employment of the term "estate" in connection with equitable interests in land, see EQUITABLE ESTATE. See also REAL PROPERTY; TENURE; and the authorities there referred to.

ESTATE. In a political sense, a distinct class or order in society. The three estates under the feudal system were the nobles, the clergy, and the commons. The feudal theory was that the basis of all power was property in land, and the clergy held their position in the feudal order by virtue of their landed proprietorship. As the lay rulers grew stronger, the temporal authority of the clergy declined, until at the present time they form a corporation rather than a class. The history of the later Middle Ages is a record of the rise of the third estate. They were the representatives of the merchant class, the *bourgeoisie*. They first arose to prominence in the free cities of Italy and of the Hanseatic League. In Spain and England, especially, the absolute power of the crown was the product of the alliance of the King and the third estate against the nobles. Before the Union (1707) the term "Estates of the Realm" was used in Scotland as equivalent to Parliament. The Legislative Assembly of Holland was also known as the States General. The States General of France, composed of the three estates, was first convened at the beginning of the fourteenth century. The last meeting previous to the Revolution of 1789 was in 1614–15. At the outbreak of the Revolution the summoning of this body was resorted to when all other expedients failed. The old established custom was to vote by orders, but as the third estate (tiers-état) would thus have been outvoted in the new Assembly, its members determined to introduce the new principle of voting individually. In this they succeeded, and, with their success and the organization of the National Assembly, the French Revolution may be said to have begun. The term "fourth estate" is often applied to the press. Its first use in that sense is attributed by Carlyle to Edmund Burke, who pointed to the reporters' gallery in the House as containing a fourth estate more powerful than the other three.

ESTATE, Separate. See Separate Estate.

ESTATE DUTY. See Death Duties.

ESTE, ĕs'tā (Lat. *Æste*). A city of Padua, north Italy, 19 miles southwest of Padua (Map: Italy, C 2). The ancient house of Este (q.v.) held control of it from 961 to 1288, followed in turn by the Carrara, Scaliger, and Visconti families. Here are the ruins of the ancestral castle. In the city museum are Roman inscriptions, in the Euganeo Preïstorico Museum is an important collection of antiquities. The manufactures are ironware and earthenware and cordage. Pop. (commune), 1901, 10,962; 1911, 11,704. Consult Nuvolato, *Storia d'Este* (Este, 1850).

ESTE, ĕs'tā, House of. One of the oldest and most illustrious families of Italy. It owed its origin to one of the petty princes who governed Tuscany in the times of the Carolingians, and who were in all probability of Lombard extraction.—The first whose figure is more than a mere shadow is Adalbert, or Oberto, Marquis of Este, one of the Italian nobles who offered the crown of Italy to Otho of Saxony. He is afterward styled *Comes Sacri Palatii* and appears to have been one of the greatest personages in the realm; he married a daughter of Otho, and died about 972 A.D. His family divided at an early period into two branches, the German and the Italian. The former was founded by Welf or Guelfo IV, who received the investiture of the Duchy of Bavaria from the Emperor Henry IV in 1070; the latter by his brother Fulco I (1060–1135). The houses of Brunswick and Hanover, and consequently the present sovereigns of Great Britain, also called Este-Guelphs, are descended from the German branch. (See Brunswick, House of.) In the twelfth and thirteenth centuries the history of the Italian family, as heads of the Guelph party, is interwoven with the destinies of the other ruling families and small republics of northern Italy. During this period they gained permanent possession of Ferrara and the March of Ancona (1276) and afterward of Modena and Reggio (1288–90). They were widely celebrated as patrons of art and literature. One of the most illustrious was Azzo VII (1205–64), who encouraged Provençal troubadours to settle at his court at Ferrara and also founded schools in that city.—Alfonso I (1486–1534) was equally distinguished as a soldier and a statesman and was celebrated by all the poets of his time, particularly by Ariosto. His second wife was Lucrezia Borgia (q.v.). His quarrel with the Popes Julius II, Leo X, and Clement VII was unfortunate, as an interdict was laid upon him for his adherence to the League of Cambrai, and his papal fiefs were declared forfeited. After the capture of Rome, in 1527, the Duke was restored to his former possessions by Charles V.—His successor, Ercole II (1508–59), married Renata, daughter of Louis XII of France, and attached himself to Charles V. He and his brother, a dignitary of the Catholic church, were also liberal patrons of art and sciences; the latter erected the magnificent Villa d'Este at Tivoli.—Alfonso II (died 1597) was fonder of luxury and splendor than of art and literature. He it was who persecuted the poet Tasso. He was also an unsuccessful aspirant for the Polish crown.—Alfonso IV, who lived in the latter half of the seventeenth century, was a lover of the fine arts, and founded the Este Gallery of Paintings at Modena. His daughter, Mary of Modena, married James II of England.—Rinaldo (1655–1737), by his marriage with the daughter of the Duke of Brunswick-Lüneburg, united the German and Italian houses, separated since 1070. Like his predecessors he was a faithful ally of Austria, although his son took the part of Spain against Maria Theresa. The male line of the house of Este in Italy became extinct on the death of his grandson, Ercole III, in 1803, his possessions having been previously seized by the French invaders and annexed to the Cisalpine Republic. His only daughter married the Archduke Ferdinand of Austria and founded the Austrian house of Este which lasted till 1875. Their eldest son, Francis IV, cousin of the Emperor Francis, was placed on the throne of Modena by the Congress of Vienna, 1814, and on his mother's death obtained the duchies of Massa and Carrara. He was succeeded by his son, Francis V, in 1846. The family of Este was pro-Austrian in sympathy, the result of which proved fatal. In 1859 Charles V was forced to resign his territories to Victor Emmanuel. He died in retirement in 1875, the last representative of the Este family, the title passing to the Archduke Francis Ferdinand, heir to the Austrian throne. A *History of the House of Este* was published anonymously in London in 1681. Consult also: Symonds, *The Renaissance in Italy* (London, 1875–86); Browning, *Guelfs and Ghibellines* (ib., 1893); Sismondi, *Italian Republics* (Eng. trans., ib., 1832); Ciscato, *Storia d'Este dalle origini al 1889* (Este, 1890); Campori and Solerti, *Luigi, Lucrezia e Leonora d'Este* (Turin, 1888); Solerti, *Ferrara e la corte estense* (Castello, 1891); Muratori, *Delle antichità estensi ed italiane* (3 vols., Modena, 1717); Gardner, *Princes and Poets of Ferrara* (London, 1904); Noyes, *The Story of Ferrara* (ib., 1904); Litta, *Famiglie Celebri Italiane* (Milan, 1808).

ESTÉBANEZ CALDERÓN, ās-tā'bā-nāth kăl'dā-rōn', Don Serafín (1799–1867). A Spanish poet and novelist. He was born in Málaga, studied law at the University of Granada, and in 1822 was made professor of poetry and rhetoric there. In 1830 he went to Madrid, where he published anonymously his only volume of poems under the title *El solitario* (1831). He also wrote several articles on Andalusian manners for the *Cartas Españolas*, the only literary journal at that period in Spain. In 1834, during the first Carlist War, he was appointed auditor general of the Legitimatist army in the north. In 1836 he was appointed *Jefe-Político* of Logroño, but an accident obliged him to return to Madrid, where he devoted himself to collecting manuscripts of the old national literature, to be the basis of a great critical edition of the *Cancioneros* and *Romanceros*. In 1838 he was appointed *Jefe-Político* of Seville. He served repeatedly as deputy and from 1856 was a member of the Council of State. Estébanez Calderón wrote also a fine novel, *Cristianos y Moriscos* (1838). His *Escenas andaluzas* (1847) are a series of lively sketches of Andalusian life and form a trustworthy account of customs that have largely disappeared. At his death he left a work on the *Expediciones y aventuras de los Españoles en Africa*. The Spanish government purchased his valuable library. Consult Cánovas del Castillo, *El solitario y su tiempo, etc.* (2 vols., Madrid, 1883).

ESTELLA, ā-stā′lyȧ. A town in the Province of Navarre, Spain, situated on the Río Ega, about 20 miles southwest of Pamplona (Map: Spain, D 1). It has a picturesque situation and one of considerable military importance, is well built, with fine streets and squares, and contains several interesting churches. The town is surrounded by a fertile region and is a place of some trade and manufactures. Pop., 1900, 5766; 1910, 5658. Estella is a town of great antiquity, perhaps the ancient Gebala. It played a prominent part in the Carlist uprisings. In 1835 the Carlists took possession of the town, and here in 1839 occurred the execution by the Carlist leader Maroto of five brother generals. During 1873–76 Estella was the main stronghold of Don Carlos and was the scene of several conflicts. Its surrender in February, 1876, occasioned a complete downfall of the Pretender's cause.

ESTEPA, ā-stā′pȧ. A town in the Province of Seville, Spain, situated in a hilly region, about 60 miles east of the city of Seville (Map: Spain, C 4). It has broad and level streets and is defended by an old Moorish castle. The parish church of Santa María la Mayor is an imposing structure in Gothic style with three naves. The chief industries are agriculture and stock raising, and the manufacture of oil, soap, etc. There are jasper quarries in the vicinity. Pop., 1900, 8773; 1910, 8234. Estepa is identified with the ancient Astapa, which became celebrated in the Second Punic War. After an heroic resistance against the Roman besiegers its inhabitants chose death by fire rather than surrender. The Romans subsequently colonized the place. In 1240 it was recovered from the Moors by Ferdinand III.

ESTEPONA, ā′stā-pō′nȧ. A maritime town in the Province of Málaga, Spain, on the Mediterranean, about 25 miles northeast of Gibraltar (Map: Spain, C 4). It is laid out with generally wide but sloping streets, and has a parish church, dating from 1474, which is in ruins. The town is in a fertile region, producing grain, wine, fruits, and vegetables, and has considerable coasting trade, though the harbor lacks shipping facilities. There are also fisheries and fish-curing interests, and manufactures of liquors, leather, rope, corks, brick, and tile. A lighthouse stands on the Punta de la Doncella, near by. Population, 1900, 9397; 1910, 9613.

ESTERHÁZY, or Eszterházy, ĕs′tĕr-hä-zē. The name of an ancient noble Hungarian family which possesses immense domains in Hungary and traces its descent from Paul Estoras, a mythical descendant of Attila, baptized in the tenth century. Two branches of the family, Zerházy and Illyésházy, appear as early as 1238. The latter line became extinct in 1838. The titles of baron, count, and prince were conferred in turn upon members of the family. The first Esterházy to become celebrated was Nicholas (1582–1645), Palatine of Hungary, an ardent supporter of the Counter Reformation. Later members of the family are: Paul IV (1635–1713), Prince Esterházy of Galánta. As Austrian field marshal, he distinguished himself in the wars against the Turks, especially at St. Gotthard in 1664, Vienna in 1683, and Buda in 1686. He was made Palatine of Hungary in 1681, and had a share in the overthrowing of Tökölyi (q.v.) and the consolidation of the Hapsburg power in Hungary. He died a prince of the Empire.—Nicholas Joseph (1714–90), Prince Esterházy of Galánta, Count of Forchtenstein, grandson of Paul IV, was Privy Councilor, field marshal, and several times Ambassador. He fought bravely in Silesia during the Seven Years' War. He was a patron of the arts and sciences and established a famous orchestra at Eisenstadt, among whose members were Pleyel and Haydn.—Nicholas IV (1765–1833), Prince Esterházy of Galánta, grandson of Nicholas Joseph, traveled widely in his youth; then entered the army, rose to the rank of general, and became prominent in diplomatic affairs. Possessed of an inherited love for the arts, he spent an immense fortune on his collections of pictures and engravings, now at the Museum of Vienna. In 1809 Nicholas refused Napoleon's offer of the crown of Hungary. Haydn found in him a most generous patron.—Paul Anton (1786–1866), Prince Esterházy of Galánta, son of Nicholas IV, was Austrian Ambassador at Dresden in 1800, at Rome in 1814, and at London from 1815 to 1842. He was Minister in the Hungarian cabinet of 1848. In 1849 he retired from public life, but was present as Austrian Ambassador at the coronation of Alexander II at Moscow in 1856. Another prominent member of the family was Moritz, Count Esterházy (1807–90), diplomat and statesman. Consult Count János Esterházy, *Description of the Esterházy Family* (Budapest, 1901).

ESTER′IFICA′TION. See Esters.

ES′TERS (arbitrary variant of *ether*), or Ethereal Salts, sometimes inaptly spoken of as "compound ethers." A class of carbon compounds formed by the union of acids and alcohols. Thus, when ordinary alcohol and strong hydrochloric acid are mixed together and heated, they combine according to the following equation:

$$\underset{\text{Ethyl alcohol}}{C_2H_5OH} + \underset{\text{Hydrochloric acid}}{HCl} = \underset{\text{Ethyl chloride (an ester)}}{C_2H_5Cl} + \underset{\text{Water}}{H_2O}$$

By analogous reactions the ester called *ethyl nitrate* may be obtained from ordinary alcohol and nitric acid; the ester called *ethyl acetate*, from ordinary alcohol and acetic acid, etc.

Another method of preparing esters, often used in the case of organic acids, is to employ not the acid itself, but its chloride. Thus, ethyl acetic ester (ethyl acetate) may be prepared by the action of ordinary alcohol upon *acetyl chloride*, CH_3COCl, which is the chloride of acetic acid. The reaction is as follows:

$$\underset{\substack{\text{Acetyl}\\\text{chloride}}}{CH_3COCl} + \underset{\text{Alcohol}}{C_2H_5OH} = \underset{\substack{\text{Ethyl acetic}\\\text{ester}}}{CH_3COOC_2H_5} + \underset{\substack{\text{Hydrochloric}\\\text{acid}}}{HCl}$$

Still another important method of making esters consists in causing the silver salts of acids to react with halogen (usually iodine) derivatives of hydrocarbons. Thus, ethyl acetic ester may be prepared from silver acetate and ethyl iodide (the latter itself made from ethyl alcohol), according to the following equation:

$$\underset{\text{Silver acetate}}{CH_3COOAg} + \underset{\substack{\text{Ethyl}\\\text{iodide}}}{C_2H_5I} = \underset{\substack{\text{Ethyl acetic}\\\text{ester}}}{CH_3COOC_2H_5} + \underset{\substack{\text{Silver}\\\text{iodide}}}{AgI}$$

The esters of organic acids, such as ethyl acetic ester, are, as a rule, colorless, pleasant-smelling, more or less volatile liquids. Some occur ready formed in the vegetable world, imparting their odor to fruits and flowers. Artificially prepared esters, therefore, serve to flavor candy, pastry, and perfumes, and are sold under the names of pear oil, apple oil, pineapple oil, etc. Other esters occur ready formed, both in the vegetable and in the animal worlds, and are known as oils and fats (qq.v.).

By the action of water esters are broken up into their components (i.e., into alcohols and acids)—a reaction which is greatly furthered by the presence of acids. Thus, ethyl acetic ester is broken up into ordinary acetic acid and ethyl alcohol according to the following equation:

$$\underset{\substack{\text{Ethyl acetic}\\\text{ester}}}{CH_3COOC_2H_5} + \underset{\text{Water}}{H_2O} = \underset{\text{Acetic acid}}{CH_3COOH} + \underset{\substack{\text{Ethyl}\\\text{alcohol}}}{C_2H_5OH}$$

Alkalies have the same effect on esters, but much more pronounced. Thus, potassium hydroxide (caustic potash) decomposes ethyl acetic ester as follows:

$$CH_3COOC_2H_5 + KOH = \underset{\substack{\text{Potassium}\\\text{acetate}}}{CH_3COOK} + C_2H_5OH$$

Esterification and Saponification. The conversion of an acid into an ester is termed *esterification*. The decomposition of an ester into its constituents is sometimes termed *saponification* (the reason for using this term is stated in the article FATS). When the saponification of an ester is effected by water alone, or with the aid of acids, but not of metallic hydroxides, the ester is said to be "hydrolyzed."

The processes of esterification and saponification have furnished a considerable portion of the material upon which certain very important theories of modern chemistry have been tested and verified. The theories themselves are explained in some detail in the article REACTION, CHEMICAL. A brief account of their bearing on the processes of esterification and saponification may, however, not be out of place in the present sketch.

It was stated above that ethyl acetic ester may be formed by the action of ethyl alcohol upon acetic acid. This reaction takes place according to the following equation:

$$\underset{\substack{\text{Ethyl}\\\text{alcohol}}}{C_2H_5OH} + \underset{\text{Acetic acid}}{CH_3COOH} = \underset{\substack{\text{Ethyl acetic}\\\text{ester}}}{CH_3COOC_2H_5} + \underset{\text{Water}}{H_2O}$$

The reaction evidently involves the simultaneous formation of water and of ethyl acetic ester. On the other hand, it was also stated above that water decomposes ethyl acetic ester into its components. Therefore, even while the ester is being formed from its components, it is broken up again by the action of the water formed along with it. In other words, two opposite reactions take place simultaneously, one being a process of esterification, the other a process of saponification. If the two processes took place with equal rapidity from the very beginning, neither could evidently make any progress; so that, whether we should mix alcohol and acetic acid, or water and ethyl acetic ester, no change at all would ensue. In reality, however, this is not the case, one of the reasons being as follows: All chemical reactions take place according to the law of mass action. By this law, the rapidity with which two given substances react with each other at a given temperature is proportional to the amounts of those substances contained in unit volume. The greater the amounts present, the more rapid the reaction. When alcohol and acetic acid are mixed together, a reaction starts in with considerable rapidity. During the reaction both substances gradually disappear as such. Their amounts present in every unit of volume, therefore, gradually diminish, and hence the reaction (i.e., the esterification) becomes gradually slower and slower. On the other hand, since the reaction produces ester and water, the amounts of these gradually increase, and hence the reaction between them (i.e., the saponification) gradually becomes more and more rapid. The velocities with which the two opposite reactions take place, therefore, tend to become equal, and when this "equilibrium" is finally reached the composition of the mixture ceases to change. Not that all reaction has then entirely ceased. Both of the opposite reactions undoubtedly continue to take place as before. Only for every amount esterified, an exactly equivalent amount is now saponified, and hence no change can be observed. In other words, a "dynamic" (not a "static") equilibrium is established in the mixture, which is now composed of four substances—acid, alcohol, ester, and water. This equilibrium can be reached in two ways: (1) by starting with a mixture of alcohol and acid, or (2) by starting with a mixture of ester and water. Thus, when 46 grams of alcohol are mixed with 60 grams of acetic acid (46 and 60 are the relative reacting weights of alcohol and acetic acid), a process of esterification ensues, and continues until the composition of the mixture becomes as follows: $15\frac{1}{3}$ grams of alcohol, 20 grams of acetic acid, $58\frac{2}{3}$ grams of ethyl acetic ester, and 12 grams of water. In this mixture no further change can take place. But a mixture of precisely the same composition is finally obtained if, to start with, 88 grams of ethyl acetic ester and 18 grams of water (88 and 18 are the relative reacting weights of the ester and of water) have been allowed to react upon each other.

All this holds good, of course, only in case none of the products of the reaction is eliminated. For if, e.g., we were to remove the water produced by the esterification, the counteracting process (i.e., the saponification) could not take place, and hence the esterification would proceed unchecked until all the alcohol and acid had combined. As a matter of fact, this is the case when some dehydrating agent (such as sulphuric acid, zinc chloride, etc.) is added to a mixture of alcohol and acid, the esterification being then practically complete.

The saponifying action of bases has long been comparatively well understood, at least in a formal, mathematically descriptive way; it is explained by the law of mass action already mentioned in this sketch, with the aid of the theory of electrolytic dissociation. (See DISSOCIATION.) The saponifying action of a base is due to its electro-negative hydroxyl ions ($\overline{OH}$). Since, according to the law of mass action, the rapidity of any reaction in general depends on the amounts of the active substances contained in unit volume, the rapidity of a saponification must depend on the amount of ester and on the amount of the hydroxyl ions present in every unit of volume. The stronger the base the greater the number of hydroxyl ions in its solution, and hence the greater its saponifying power. If the base is weak (like ammonium hydroxide), its small number of hydroxyl ions is still further (and very considerably) diminished by the presence of one of its salts; hence the presence of such salts has a retarding effect on the process of saponification, especially in case the base is weak. Further, since a salt necessarily forms during the saponification (see, e.g., the equation representing, above, the saponification of ethyl acetic ester by caustic potash), the rate of saponification must be diminished not only by the disappearance of the ester and base as such, but also by the formation of the salt and free alcohol, the products of the reaction. The mathematical application of these principles leads to a method of calculating the rapidity with which a saponification may take place, if the amounts of ester and base and the strength of the latter are given. The results thus obtained on a purely theoretical basis have, in a large number of cases, been verified by actual experiment, and the agreement of the theoretical and experimental figures has been found good throughout.

The hastening (see CATALYSIS) of esterification and of ester hydrolysis by acids has been the subject of numerous investigations: but its mechanism is not yet clearly understood. The "stronger" a given acid is found to be when examined with regard to its power of conducting the electric current in aqueous solution, the greater is also found to be its catalytic effect upon the formation and hydrolysis of esters. From this it has been concluded that it is not the acid as a whole, but its free hydrogen ions that hasten the reaction. But nothing is positively known as to *how* hydrogen ions can hasten a reaction. Furthermore, the intervention of other factors is indicated by the fact that the observed reaction velocity is by no means directly proportional to the number of hydrogen ions present.

The phenomena of so-called "direct esterification" (i.e., esterification as it takes place between an organic acid and an alcohol in the absence of a strong foreign catalyzing acid) have been closely investigated by Rosanoff with several collaborators. Here, too, the reaction is catalyzed, but the catalytic agent is the esterifying acid itself; the absence of a foreign catalyzer simplifies the problem and permits of gaining deeper insight into the mechanism of the reaction. The acid principally employed in these studies was benzoic acid, which was esterified with ethyl alcohol, the reacting mixture being dissolved in acetone and kept for definite periods of time, in sealed tubelets, at the temperature of boiling aniline (183° C.). The results have shown that under these conditions *three* molecules take part in the reaction: *two* of the acid and *one* of alcohol. Previous to these investigations it was generally believed that the reaction proper takes place between *one* molecule of alcohol and *one* molecule of acid, as would be indicated by the ordinary chemical equation:

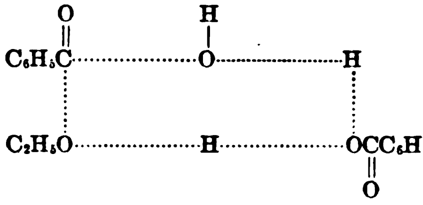
$$\underset{\text{Benzoic acid}}{C_6H_5COOH} + \underset{\text{Ethyl alcohol}}{C_2H_5OH} = \underset{\text{Ethyl benzoic ester}}{C_6H_5COOC_2H_5} + \underset{\text{Water}}{H_2O}$$

The true equation is:

$$2C_6H_5COOH + C_2H_5OH = C_6H_5COOC_2H_5 + H_2O + C_6H_5COOH$$

The "catalyzing" part of the acid thus takes part in the reaction as well as the "esterifying" part, as is shown by the fact that the two parts obey the law of mass action equally well. (See CATALYSIS.) Moreover, Rosanoff and his collaborators have succeeded in showing that the three reacting molecules first form one triple molecule, which subsequently breaks down with formation of single molecules of ester, water, and acid (the three substances shown to the *right* of the equality sign in the last equation above). But the same triple molecule can also be formed by the union of single molecules of ester, water, and acid, and it can also break down into two molecules of acid and one molecule of alcohol (the substances formulated to the *left* of the equality sign in the true equation of the process). Accordingly the reaction takes place in two stages: in the first the triple molecule is formed, in the second it is decomposed; and it is reversible because the intermediate triple molecule can both be formed from, and decomposed into, the two sets of single molecules involved, so that the same state of equilibrium must ultimately be produced whether we start with two molecules of benzoic acid and one of alcohol, or with single molecules of ester, water, and acid.

All the known facts in the case, which space does not permit of discussing in the present article, point to the following formula as representing the structure of the intermediate triple molecule:



The dotted lines here denote *half* valencies, whose rupture constitutes the last stage of the reaction (i.e., the stage following the formation of the complex molecule itself). However, this structural formula, while interesting as a faithful summary of a variety of facts, is nevertheless hypothetical, as such formulæ must remain in the present state of chemical science.

ES'TES, DANA (1840-1909). An American publisher, born at Gorham, Me., and educated in the public schools. He worked several years as a clerk, and served in the Federal army in the Civil War until disabled by wounds. He became a member of the publishing firm of

Degen, Estes & Co., subsequently was with Lee and Shepard, and in 1872 became a partner in the house of Estes and Lauriat. This latter firm was succeeded in 1898 by Dana Estes & Co. As a traveler, Estes was the first American to explore the Nile country to Uganda, and the Congo Free State. He also organized and was first secretary of the International Copyright Association. He compiled *Chimes for Childhood* (1868) and *Spectrum Analysis Explained* (1872) and edited *Half-Hour Recreations in Popular Science* (1874; 2d ed., 1879).

ESTEVAN, ĕs'tė-vän. A town in Assiniboia District, Saskatchewan, Canada, on the Souris River, and on the Canadian Pacific Railway, 145 miles southeast (direct) of Moosejaw and about 295 miles southwest (direct) of Winnipeg (Map: Saskatchewan, H 8). Among the manufacturing industries are lumber and brick yards and flour mills. There are grain elevators and implement-distributing warehouses, and a government coal-testing plant. The town is an important shipping centre for coal and brick. There is a municipal electric-light plant. Pop., 1901, 181; 1911, 1981; 1914 (local est.), 4000.

ESTHER, ĕs'tẽr (Heb. *Ester;* cf. Babylonian *Ishtar*, and late Bab. *Estrā*), or HADASSAH (Heb., myrtle). A biblical character who has given her name to the Book of Esther, which forms part of the collection of the Old Testament. According to this book, Esther is a Jewess of the tribe of Benjamin. She is represented as the daughter of Abihail, orphaned in early life, and brought up by her cousin Mordecai (Esther ii. 7, 15) in Susa, the Persian capital (ii. 5). When the King of Persia, Ahasuerus (Xerxes, 485–465 B.C.), angered at the refusal of his Queen, Vashti, to unveil herself publicly at a banquet, desired a new queen (i–ii. 4), Esther was brought to the palace and was chosen in Vashti's place (ii. 8–20). As Queen, she accomplished that for which she has since been famous—the deliverance of her nation from the cruelty of Haman, the King's vizier, and also brought about the overthrow of Haman himself (iii–ix). In commemoration of this deliverance the Jews celebrate the Feast of Purim. See PURIM.

There are several difficulties involved in supposing Esther to have actually been the Queen of Xerxes. Herodotus mentions Amestris as the only Queen of Xerxes, and what we know of her does not at all agree with the story of Esther. Moreover, the Persian kings chose their wives from the principal Persian families or from the daughters of foreign potentates. Hence it has been supposed that Esther was in reality merely the favorite of the King's harem. But even this is unlikely; and many scholars now hold that she is an entirely mythical character, identical with Ishtar, the Babylonian goddess. See ESTHER, BOOK OF.

ESTHER. 1. A drama by Racine, written at the suggestion of Madame de Maintenon, and founded on the life of the Old Testament personage of the same name. It was written for the pupils of Saint-Cyr, and was performed by them before Louis XIV in 1689. 2. An oratorio, the words by Humphreys, based on Racine's play, and the music by Handel. Its first performance took place in 1720.

ESTHER, BOOK OF. One of the very latest of the canonical books of the Old Testament, belonging to the third division of the collection known as the Hagiographa. It contains the story of the deliverance of the Jews of Persia from a destruction planned for them by Haman, the Grand Vizier of Ahasuerus (Xerxes, 485–465 B.C.). The heroine of the book is a Jewess whose original name is Hadassah, but who appears as Esther. The scene is laid at the court of Ahasuerus, in Susa. The King, who has deposed his Queen, Vashti, for refusing to obey his orders that she show her beauty to the revelers at the King's banquet, gives direction to seek for a beautiful woman to take Vashti's place. Esther, a Jewess, is selected as the fairest of maidens and meets with the favor of the King. She is the cousin of Mordecai, a Jew of the tribe of Benjamin, by whom she has been brought up; but shortly after Esther's elevation a great disaster threatens her people through the refusal of Mordecai to pay homage to Haman, the Grand Vizier, and who is a descendant of Agag, King of Amalek (1 Sam. xv). Haman in great anger proceeds to Ahasuerus and, accusing all the Jewish subjects of disloyalty, offers to put 10,000 talents of silver into the royal treasury as the proceeds of the permission to pillage the Jews. The King consents and issues an edict for the extermination of the Jews and the confiscation of their property. At this moment Esther, urged on by Mordecai, intervenes. Uninvited, she enters the presence of the King to intercede on behalf of her people. The King receives her graciously and accepts her invitation to dine with her on two consecutive nights. On the night preceding the second banquet, at which Esther intended to make known her request, the King learns from the royal archives of the services rendered by Mordecai in discovering a conspiracy against Ahasuerus' life, for which he had never been rewarded. Haman, too, comes to the banquet, and the King, having in mind Mordecai, asks Haman what should be done with the man whom the King delighteth to honor. Haman replies, and endures the humility of himself leading Mordecai in triumph through the streets. At the second banquet Esther discloses her nationality and exposes the designs of Haman, who is seized and ordered to be executed on a gallows which he had prepared for Mordecai. The latter is raised to the vacant post of honor, and the Jews are given permission to defend themselves against the carrying out of the order for their extermination, which, in accordance with the customs of the Medes and Persians, could not be revoked. A great dread falls upon the people, and on the day set for the extermination of the Jews the latter slay 500 men in Susa, and 75,000 of their enemies in the Persian Empire. Esther then makes a further request that the Jews be permitted to slay their enemies in Susa the following day, and this is granted, 300 more being killed on the 14th of Adar. In commemoration of the deliverance the Feast of Purim was instituted.

The Book of Esther, as is now generally recognized by scholars, is a romance, which may, however, contain an historical kernel, being based on some persecution endured by the Jews of Susa. Mordecai and Haman, as descendants of Benjamin and Agag, typify the old feud between Hebrews and Amalekites. It is also probable that a Babylonian legend or myth has guided the author of the book in some of the situations of the dramatic tale. Mordecai is a derivative of Marduk, the chief god of Babylonia; Esther is a form of the Babylonian goddess Ishtar; while Haman and Vashti are names analogous to those borne by Elamitic deities. The story thus represents the conflict between Babylonian and Elamitic gods. The Feast of Purim also presents analogies to the Babylonian New Year's Festival.

The language of the book, as well as the circumstance that the Persian Empire is treated as a thing of the past, favor a late date for the composition. It was probably written in the second century B.C. The Greek translation was introduced in Egypt in the fourth year of Ptolemy and Cleopatra, probably 114 B.C.; and as its purpose was to urge the Egyptian Jews to observe the Purim festival, the book is not likely to have been written long before this date. It seems to have been written originally as a plea for the general observance of a festival which appears at one time to have been limited to the Jews of Babylonia and Persia. See Purim.

Consult, besides the commentaries on the Book of Esther by Wildeboer (Freiburg, 1898), Siegfried (Göttingen, 1901), Paton (New York, 1908), the introductions to the Old Testament (see Exegesis), and the articles of Toy, "Esther as a Babylonian Goddess," in *The New World*, vol. vi (Boston, 1897); Zimmern, in *Zeitschrift für Alttestamentliche Wissenschaft*, vol. x (Giessen, 1891); Jensen, in *Wiener Zeitschrift für die Kunde des Morgenlandes*, vol. vi (Vienna, 1892); Erbt, *Die Purimsage in der Bibel* (Berlin, 1900); Paul Haupt, in *Beiträge zur Assyriologie* (Leipzig, 1906), and in *American Journal of Semitic Languages and Literatures* (Chicago, 1908).

ESTHER, Deuterocanonical Fragments in Book of. In the Greek translations of the Book of Esther there are seven somewhat extensive passages not found in the Hebrew text. They are regarded by many Roman Catholic scholars as parts of the original text which were removed from the Hebrew, perhaps in order that the name of God—used in these passages, but not in the rest of the book—might not be dishonored when the roll was read during the rather secular festival of Purim. Most Protestant scholars regard them as interpolations, intended to supplement and amplify the story, which became a favorite with the Jews. The late Greek origin of these additions seems to be indicated by such a detail as the representation of Haman as a Macedonian who attempted to transfer the sovereignty from the Persians to the Macedonians, and by the contradictions between them and the Hebrew text. These additions, which are therefore supposed to be the work of Hellenistic writers, were all put by Jerome, in his Latin translation of the Bible, at the end of the book, together with notes to show where other additions to the Hebrew occur in the Greek. This relegation of the additions to an appendix was unfortunate, as it obscured the relation to the chapters in which they were originally inserted. In English versions they are embodied in the Apocrypha under the title "The Rest of the Chapters of the Book of Esther." They consist of (1) Mordecai's dream and the conspiracy of the two eunuchs (precedes Esther i. 1); (2) the King's edict commanding the destruction of the Jews (follows iii. 13); (3) Mordecai's exhortation of Esther (follows iv. 8); (4) prayer of Mordecai and prayer of Esther (follows iv. 17); (5) Esther's appearance before the King (amplification of v. 1, 2); (6) the King's second edict, in favor of the Jews (follows viii. 12); (7) interpretation of Mordecai's dream (follows x. 3). They are supposed by many scholars to have been written in the first century B.C. In the Aramaic paraphrases of Esther, of which there are two, known as the first and second Targums to Esther, there are similar embellishments, independent of the Greek additions. See Deuterocanonical Books. Consult: Bissell, *The Apocrypha of the Old Testament* (New York, 1880); Fuller, in Wace, *The Apocrypha* (ib., 1888); Kaulen, *Einleitung in das Alte Testament* (4th ed., Leipzig, 1912); Scholz, *Kommentar über das Buch Esther mit seinen Zusätzen* (Würzburg, 1892); Cornely, *Introductio in V. T. Libros Sacros*, ii, 1 (Paris, 1897); Ryssel, in Kautzsch, *Die Apokryphen und Pseudepigraphen des Alten Testaments* (Tübingen, 1900); André, *Les Apokryphes de l'Ancien Testament* (Florence, 1903); Jahn, *Das Buch Esther nach der Septuaginta hergestellt* (Leiden, 1901); Streane, *The Book of Esther* (New York, 1907); Paton, *The Book of Esther* (ib., 1908); Gregg, in Charles, *The Apocrypha and Pseudepigrapha of the Old Testament* (Oxford, 1913).

ESTHER, Queen. An Indian Chieftainess. See Montour.

ESTHE′RIA (Neo-Lat., anagram of St. *Theresa*). A bivalve phyllopod crustacean of the order Branchiopoda, found in a fossil state in deposits of fresh and brackish water origin, from the Devonian to the Pleistocene. The animal is not well segmented and is able to withdraw itself wholly within its shell. (For its anatomical characters, see the articles on Crustacea and Phyllopoda.) The shell varies in size from ⅛ to 1 inch in length and is of rounded, flattened form, with moderately prominent beaks near the hinge line. In texture it is thin and membranaceous, and the surface is usually marked by concentric folds or imbricating ridges between which are trellised or anastomosing lines. This latter character serves to distinguish Estheria shells from the shells of small pelecypods such as Posidonomya. One species (*Estheria membranacea*) is found in the Old Red Sandstone of the British Devonian, in equivalent beds of Germany, and in the contemporaneous formations of the Oneonta-Catskill group of New York State. About 24 living species of *Estheria*, and about an equal number of fossil species, are known from widely distributed regions. Allied genera are *Limnadia* and *Limnetis*, each represented by a few species, and the fossil genus *Leaia*, found in the Carboniferous and Permian formations, which differs from *Estheria* in the presence of diagonal ridges that run from the umbones to the ventral margins of the shell.

Consult: Jones, "A Monograph of the Fossil Estheriæ," *Monographs of the Palæontographical Society* (London, 1862); "On Fossil Estheriæ and their Distribution," *Quarterly Journal of the Geological Society of London*, vol. xix (ib., 1863). See also Crustacea; Phyllopoda; and, for illustration, see Plate of Phyllopoda.

ESTHERVILLE, ĕs′tẽr-vĭl. A city and the county seat of Emmet Co., Iowa, about 140 miles (direct) northwest of Des Moines, on the Des Moines River, and on the Chicago, Rock Island and Pacific and the Minneapolis and St. Louis railroads (Map: Iowa, C 1). The city contains a Carnegie library and a fine high-school building. It is situated in an agricultural and stock-raising district and has grain elevators, flouring mills, railroad machine shops, creameries, a tub factory, cement-products works, musical instrument and cigar factories, etc. The wholesale interests are considerable. The water works and electric-light plant are owned by the municipality. Pop., 1900, 3237; 1910, 3404.

ESTHONIA (Esthonian *Esti-ma*, Esthland). A province of the old Russian Empire which became an independent state on Feb. 2, 1920. Besides the old province of Esthonia it includes the northern part of Livonia, the islands of Moon Sound, and a small part of the government of Petrograd. The estimated area is about 20,000 square miles, and the population 1,600,000, of which more than 90 per cent are Esthonian. The language is Esthonian, but German and Russian are generally spoken and understood. A great majority of the people are Lutherans. Elementary education is compulsory. The University of Dorpat is now under Esthonian auspices. Reval is the chief seaport and capital.

The chief occupation of the people is agriculture. In 1919 a movement was begun to divide up the large estates. The chief crops are rye, oats, barley, and potatoes. In 1920 the yield of potatoes was 21,232,605 bushels, oats 5,319,471, winter rye, 3,788,955, and barley 2,514,555. In the same year there were 155,489 horses, 414,955 cattle, 497,838 sheep, and 244,912 pigs. The live stock decreased largely during the war.

The chief industries are textiles, shipbuilding, metal works, mining, and chemicals. During and after the war (1914-18) the industries almost came to a standstill largely because of inability to get raw materials. Before the war 50,000 people were employed in industry, but after it less than one-fifth that number.

In 1920 the exports amounted to $17,544,278 and the imports to $19,931,218. The chief exports were flax, paper, spirits, and timber. The chief imports were coal, fertilizers, fish, salt, and petroleum. The budget expenditures proposed for 1922 were 5,500,000,000 marks. After the war the finances were in a deplorable state. The Esthonian mark greatly depreciated.

The form of government was provided by the constitution which went into effect Dec. 20, 1920. The executive power is vested in a state head and a ministry chosen by the assembly, and the legislative power in an assembly of 100 members elected for three years by universal, direct, equal and secret suffrage, on the basis of proportional representation.

History. After the Russian Revolution in 1917, Esthonia claimed its independence. It was recognized by Great Britain on Feb. 4, 1918. Subsequently other nations recognized it. France and the United States refused to do so on the grounds that it was a part of the old Russian Empire. The Bolsheviks recognized its independence on Feb. 2, 1920. See Russia and Volume XXIV.

ESTHS. See Esthonia.

ESTIENNE, ā′tyĕn′. See Stephanus.

ESTIVAL. See Æstival.

ES′TIVA′TION. See Hibernation and Estivation.

ESTLANDER, ĕst′lănd-ĕr, Carl Gustaf (1834–1910). A Finnish writer on art history. He was appointed professor of æsthetics at the University of Helsingfors in 1868. He founded and became editor of the *Finland Review* in 1876 and wrote a number of valuable works which have contributed to the industrial and artistic progress of his country. Among his works are: *The History of the Plastic Arts from the Middle of the Eighteenth Century until our own Time* (1867); *The Development Past and Future of the Art and Industry of Finland* (1871); *Richard Cœur de Lion in History and Poetry* (1858); *The Robin Hood Ballads* (1889); and some researches into the romance of Tristan, in French (1866).

ES′TOC (OF., from OHG., MHG. *stoc*, Ger. *Stock*, Eng. *stock*). A small dagger worn at the girdle and called in Elizabethan times a "tuckle."

ESTOILE, ĕs-toil *or* ĕs-twäl′ (OF., star), or Star. A bearing in heraldry. It differs from the mullet (q.v.) in having six waved rays, the mullet consisting of five plain ones.

ES′TON. A town in the North Riding of Yorkshire, England, about 4 miles east-southeast of Middlesbrough. Its chief industry is the manufacture of steel rails. Pop., 1901, 11,200; 1911, 12,026.

ESTOP′PEL (from *estop*, from OF. *estoper*, *estouper*, Fr. *étouper*, from ML. *stoppare*, Lat. *stuppare*, *stupare*, to stuff with tow, cram, from *stuppa*, *stupa*, Gk. *στύππη*, *styppē*, *στύπη*, *stypē*, oakum). A legal impediment or bar which precludes a person from alleging or denying a fact because of his previous conduct. Estoppels are divided into three classes, which will be considered separately:

1. **By Record.** This class includes not only the formal and final judgment in a judicial proceeding, but the pleadings of the parties and all other papers or orders which go to make up the record of the case. If any mistake has been made in the record, the party injuriously affected by it must obtain relief by an application to the court to correct it or by an appeal to a higher court. When the record is allowed to stand, it is conclusive evidence of its truth. If the judgment is one in rem, i.e., if it is an adjudication as to the status of a person or thing, it is conclusive against the whole world. Every one is estopped from setting up the truth at variance with the judgment. If A is duly adjudged a bankrupt, no one is allowed, while such judgment stands, to dispute his condition of bankruptcy. If the judgment is in personam as a judgment for a sum of money, it is conclusive upon the parties, but not upon strangers.

2. **By Deed.** Where a person has entered into a solemn engagement by deed, i.e., by written instrument under seal, he is not allowed, while the deed remains unimpeached, to deny the truth of any assertion which he has made therein. If the grantor of land recites in his deed that he is the owner of it, he will be precluded from showing that he was not.

3. **In Pais, or by Conduct.** At present, this is by far the most extensive of the three classes of estoppel, although in Lord Coke's time it was limited to estates in land acquired by livery of seisin, by entry, by acceptance of rent, and by acceptance of an estate.

Estoppels by record and estoppels by deed are often spoken of as "odious," because, being of a technical character, they operate harshly at times. Estoppels in pais do not rest upon considerations of general policy, such as have led to the establishment of the other classes, but upon the doctrine that where one by his conduct causes another to believe the existence of a certain state of things, and induces him to act on that belief so as to alter his previous position, the former is precluded from averring, as against the latter, that a different state of things existed at the time in question. These estoppels are treated with favor by the courts, and their scope is increasing constantly. They are known also as "equitable estoppels" and have their foundation in fraud. But while the conduct which produces an estoppel in pais is generally fraudulent, it is not always nor necessarily of that character. An example is afforded by one who withdraws from a partnership. He must give notice of his withdrawal or he will be estopped from showing that he has ceased to be a member as against one who has become creditor of the firm upon the assumption that he was still a member. Nor will it be any defense that his former partner agreed to give the proper notice of dissolution. It is his duty to be active in the matter; to see that such notice is given as will in the ordinary course of business protect third persons from trusting the firm on the assumption that he is still a partner.

The modern American doctrine of *title by estoppel* has more in common with the estoppel in pais than with that by deed. It arises where an interest in land is purported to be conveyed by deed and the deed contains a covenant of warranty or equivalent covenant of title. Such a deed, though made by one having no estate to convey, vests the title by anticipation in the grantee, which becomes a valid and effectual title if at any time thereafter the land should come to the grantor, no further conveyance being necessary to divest the title of the grantor or to confirm that of the grantee. (See FEOFFMENT; WARRANTY.) Consult: Blackstone, *Commentaries* (London, 1886); Bigelow, *Treatise on the Law of Estoppel* (5th ed., Boston, 1890); Ewart, *An Exposition of the Principles of Estoppel by Misrepresentation* (Toronto, 1900); Black, *Treatise on the Law of Judgments including the Doctrine of Res Adjudicata* (2 ed., St. Paul, 1902).

ESTOURNELLES (ĕs'tōōr'nĕl') **DE CONSTANT**, PAUL HENRI BENJAMIN, BARON D' (1852–). A French publicist, born in La Flèche, Sarthe. He was a grandnephew of Benjamin Constant and was educated at the Lycée Louis-le-Grand, Paris, and at the School of Oriental Languages. He entered the diplomatic service, was secretary of the commission for the delimitation of Montenegro, and later was chargé d'affaires in Montenegro, and, after service in Tunis, at The Hague and (1890–95) in London. He was a deputy from Sarthe in 1895–1904 and then was elected senator. An ardent advocate of international peace, he was a member of The Hague conferences and of The Hague Court, and did much to calm and check angry feeling between France and Germany. He received the Nobel prize for peace in 1909. He wrote for French, English, and American reviews; published a volume on modern Greece and translations from modern Greek drama; reports of The Hague conferences; papers for the Interparliamentary Union and the Universal Races conference; a volume on aviation; *Les congrégations réligieuses chez les Arabes* (1887); *La politique française en Tunisie* (1891, winning the Prix Therouanne); and *Les Etats Unis d'Amérique* (1913), based on his visits to the United States in 1902, 1907, 1911, and (for the Champlain Celebration) in 1912.

ESTO'VER (OF. *estover*, *estouvier*, need, necessity, from *estorer*, *estuvoi*, to furnish). An ancient term of the common law, used originally of any necessary supplies to which a person was entitled out of the estate of another, but now limited to the right of a tenant to take necessary firewood and wood for repairs from the demised premises. In the former sense it was once employed to describe the alimony, or sustenance, to which a woman divorced from her husband *a mensa et thoro* was entitled. In the latter sense it is by English writers more frequently known by the Anglo-Saxon term *bote*, as house bote, a right of wood for fuel and the repair of the house; plow bote, wood for plows and carts; and hay bote, wood for repairing hedges and fences. The right of estover is an incident of the usual forms of subordinate tenancy—for life, for years, from year to year, and at will—and is fully recognized in the United States as well as in England. See LANDLORD AND TENANT; and cf. WASTE.

ESTRADA, ĕs-trä'ᴅȧ, LA. A town in the Province of Pontevedra, Spain, 15 miles south by east of Santiago de Compostela on the Río Ulla. It is situated in a populous mountain region and is engaged in farming and stock raising, lumbering, and the manufacture of woolen and linen goods. There are mineral springs here. Pop., 1900 (commune), 26,838; 1910, 27,898.

ESTRADA CABRERA, ȧs-trä'ᴅa kȧ-brä'rȧ, MANUEL (1857–). A Central American politician, and a president of Guatemala, born at Quezaltenango. After completing his studies in philosophy and law, he devoted himself to legal practice, rising to be a district judge, and a justice of the Supreme Court; and in 1885 he actively entered politics as a representative in the National Assembly. In 1892 he was appointed Secretary of State; in February, 1898, upon the assassination of President Barrios, he became acting executive; in September of that year he was elected President; and he was reelected for the term 1905–11. He consistently advocated important measures for the progress of the country: the putting of the currency on a sound basis; the aiding of public works, especially in agricultural and industrial lines; the expansion of the budget for public instruction; in short, anything that would aid the cultural development of the country. Despite all this, he gained bitter enemies, and several attempts were made on his life. In March, 1911, he was again reëlected for the term 1911–17.

ESTRADES, ĕs'träd', GODEFROI, COMTE D' (1607–86). A French soldier, born at Agên. He was a page of Louis XIII, went on a mission to Holland in 1646, became colonel of infantry, and *maréchal de camp* in 1647. In 1661 he was made Ambassador Extraordinary to England, and conducted the negotiations on the cession of Dunkirk to the French. He was Ambassador to Holland in 1646–68, and then in the campaign that followed received the baton of marshal (1675) for gallantry at Wesel, Maestricht, and Liége. He represented his country in the congress that arranged the Peace of Nymwegen (1678). *Lettres, mémoires et négociations* (9 vols., Paris, 1758; and a supplementary vol. in London, 1763) were published posthumously. Consult Philippe Lauzun, *Le Maréchal d'Estrades* (Agên, 1896).

ESTRAY' (OF. *estrayer*, *estraier*, to stray, from *estree*, *stree*, Prov. *estrade*, street, from Lat. *strata*, street, from *sternere*, to strew; according to another etymology from ML. *extravagari*, to wander beyond, from Lat. *extra*, beyond + *vagari*, to wander). Any animal, the subject of property and not *feræ naturæ*, or wild, which is found without apparent owner at large in a public place or on the land of any one not the owner. If trespassing on private land, an estray may, in England and generally in the United States, be impounded at the cost of the owner reclaiming it, and in some jurisdictions may be distrained *damage feasant*. In England, if found within the limits of the royal demesnes or of a manor where it does not belong, an estray becomes subject to the lordship of the King or lord of the manor, who acquires a qualified property therein. This right of property becomes absolute if the animal be not reclaimed by the owner within a year and a day after due proclamation made by the lord of the manor. This doctrine is a peculiar exception to the general rule of law, which protects the title of the loser of goods until his claim becomes barred by the Statute of Limitations. It does not obtain in the United States, where the status of estrays and the rights of their owners are for the most part regulated by statute. In some States the finder of a strayed animal may, after a reasonable time and due advertisement, sell it at public or private sale and pass a good title to the purchaser. The proceeds of the sale, after paying the reasonable charges of the vendor, are usually paid into the treasury of the town, county, or State. Consult Burn, *Justice of the Peace and Parish Officer* (30th ed., London, 1869), and Scriven, *Treatise on Copyhold, Customary Freehold, etc.* (ib.).

ESTREAT′ (OF. *estret*, *estrait*, Fr. *extrait*, extract, from OF. *estraire*, Fr. *extraire*, to draw out, from Lat. *extrahere*, to draw out, from *ex*, out + *trahere*, to draw). In English law, a true extract, copy, or note of some original writing or record, and specially of fines or amercements, as entered in the rolls of a court, to be levied by bailiffs or other officers. When applied to a recognizance (q.v.), it signifies that the recognizance itself is estreated, or taken out from among the other records, and sent to the exchequer for enforcement. If the condition of a recognizance be broken, the recognizance is forfeited; and on its being estreated the parties become debtors to the crown for the sums in which they are bound. Under the present practice in England the King's Remembrancer issues process for the enforcement of estreats, subject to the supervisory power of the King's Bench Division of the High Court of Justice.

ESTRÉES, ȧ'strȧ', GABRIELLE D' (c.1573–99). The favorite of Henry IV of France. She was the daughter of Marquis Antoine d'Estrées, Governor of the Isle de France. In her father's absence she received Henry IV at her father's castle at Cœuvres in 1590 and inspired him with a violent passion. To avoid scandal, her father forced her to marry M. d'Amerval de Liancourt, but Henry had the marriage dissolved and summoned her to court. She bore Henry several children and was created by him Marchioness of Monceaux and Duchess of Beaufort. Her amiable and sweet disposition endeared her to all. She was shown every mark of favor by the King, was given many rich presents, a splendid domain, and a great income. So great was his infatuation that he stood ready to divorce his wife Marguerite de Valois and to marry Gabrielle, and it was only her sudden death in 1599 that prevented the step. Consult Desclozeaux, *Gabrielle d'Estrées* (Paris, 1889), and Loiseleur, *Questions historiques du XVIIe siècle*.

ESTRELLA DE SEVILLA, ȧ-strȧ'lyȧ dȧ sȧ-vē'lyȧ, LA. A comedy by Lope de Vega, abounding in strong situations, and considered by many to be Lope's masterpiece.

ESTREMADURA, ĕs'trȧ-mȧ-dōō'rȧ. A province of Portugal bounded by Beira on the north, by Alemtejo on the east and south, and by the Atlantic Ocean on the west (Map: Portugal, A 3). Area, 6711 square miles. The surface is generally mountainous except in the south. The chief river is the Tagus, which divides the province into two parts. The climate is temperate and healthful; earthquakes occasionally occur. There are extensive forests, and the soil in certain sections yields good crops of grain and fruit. The population is sparse, and the province is in a generally backward condition. For administrative purposes Estremadura is divided into the three districts of Lisbon, Leiria, and Santarem. Pop., 1890, 1,083,290; 1900, 1,231,418; 1911, 1,438,726.

ESTREMADURA, ĕs'trȧ-mȧ-ᴅōō'rȧ. An old province of Spain, situated in the southwestern part of the country, and bounded on the north by León, on the south by Andalusia, on the west by Portugal, and on the east by New Castile (Map: Spain, B 3). It is divided into the two provinces of Badajoz and Cáceres. Area, 16,162 square miles. Although a continuation of the high table-land of New Castile, Estremadura differs somewhat in the formation of its surface. Its northern part is occupied by the lofty and well-wooded Sierra de Gredos and Sierra de Gata. The Sierra de Guadalupe forms the watershed between the Tagus and Guadiana, the chief rivers of Estremadura. It is less elevated and has a sandy soil. South of the Guadiana the country becomes more sterile and contains little agricultural land. But even in the fertile portion of Upper Estremadura agriculture is in a state of neglect, more attention being paid to the breeding of domestic animals. Estremeño pork, bacon, and hams vie in celebrity and flavor with those of Westphalia. Copper, lead, silver, and coal are found, but are only slightly exploited. The chief articles of commerce are animal products, which are largely smuggled into Portugal. Pop., 1887, 821,300; 1897, 853,438; 1900, 882,410; 1910, 990,990. The inhabitants are poor and illiterate and from want of roads are isolated from the rest of Spain. They make excellent soldiers, however, having produced a series of *conquistadores* and generals, e.g., Cortés and Pizarro, to mention only the two who were most celebrated.

ESTREMOZ, ĕs'trȧ-mōs'. A town in the Province of Alemtejo, Portugal, situated about 32 miles by rail northeast of Evora (Map: Portugal, B 3). It is built at an altitude of over 1500 feet and is defended by two half-ruined forts. Estremoz is famous for its earthenware of porous clay, which is in use all over the peninsula. In the neighborhood is quarried marble of different colors, and the town exports fine wool. Pop., 1890, 7107; 1900, 7857.

ESTREPE′MENT (OF. *estrepement*, from *estreper*, to waste, from Lat. *extirpare*, to uproot, from *ex*, out + *stirps*, trunk of a tree). 1. Waste or spoliation of lands, committed by a tenant for life or years. Used in this sense, the term has become obsolete, having been supplanted by the term "waste" (q.v.). 2. An ancient writ or process of the common law instituted to restrain or prevent the commission of waste. With the development of the jurisdiction of courts of equity in the prevention of waste, the common-law remedy has become obsolete. In Pennsylvania, where there are no courts of equity, the writ of estrepement is still in use for the purpose of preventing waste.

ES'TRUP, Jacob Brönnum (1825–1913). A Danish statesman, born at Sorö. He took his seat in the Landsthing in 1864, was leader of the Agrarians, and active in the revision of the constitution in 1866. As Minister of the Interior in 1865–69, he furthered the railway service of the kingdom. In 1875 he became President of the Council and Minister of Finance. He was continually involved in difficulties with the Folkething, which disapproved the conservative policy of strengthening the defenses of Copenhagen. Estrup made use of the royal power of issuing provisional acts, even finance acts after 1877, and from 1885 to 1894 carried on the government by a provisional budget. His resignation in 1894 marked the transfer of power from the crown and the Landsthing to the Folkething. He opposed the sale of the Danish West Indies in 1902, but afterward had little influence except with a small part of the Right; and in 1908 his opposition to the electoral and tax reforms was unsuccessful.

ES'TUARY (from Lat. *æstuarium*, estuary, from *æstus*, tide). The widened channel at the mouth of a river, in which there is marked tidal action. An estuary is usually formed by submergence or "drowning" of the river valley, which then is subjected to the erosive action of tides and waves. The channels of estuaries are generally shoal and are obstructed by shifting bars. During the flow of the tide the sand and mud brought down by the river is carried up the estuary and partially deposited, while a portion is borne down again by the ebb. This continual oscillation of sediment is evidenced by the turbidity of the waters. In many estuaries the tides rise very rapidly, advancing against the river current in the form of a huge wave, a phenomenon commonly called "bore" (q.v.). Good examples of estuaries are found at the mouth of the Delaware, St. Lawrence, La Plata; the Thames and Severn in England; the Elbe in Germany; and the Gironde in France. See River.

ESZÉK, ĕs'āk (Ger. *Esseg*, Croat. *Osjek*). A royal free city of Croatia-Slavonia, Kingdom of Hungary, the chief industrial and commercial centre of Slavonia, capital of the County of Virovitica (Map: Hungary, F 4). It is situated on the Drave, which is navigable to the Danube. The city consists of the fortress, the upper town, the lower town, and the new town. Its chief public edifices are the residence of the commandant of the fort, the town hall, the county building, a Capuchin and a Franciscan monastery, and the casino with theatre. It has a gymnasium and two teachers' colleges. The manufactures include notably flour, leather, silk goods, and glassware. It has a large river trade in grain, meat, wood, oak, staves, fruit, honey. Eszék was the Mursa or Mursia of the Romans. During the Hungarian revolution the town was at first held by Count Batthyânyi, but shortly capitulated to the Austrian general, Baron Trebersberg. Population, mostly Germans, 1900, 24,930; 1910, 31,388.

ESZTERGOM, ĕs'tĕr-gôm, or **GRAN**, grăn (Hung. *Esztergom*, Lat. *Strigonium*). A royal free town of Hungary and capital of the county of the same name, on the right bank of the Danube, 25 miles northwest of Budapest (Map: Hungary, F 3). It consists of the town proper, the archiepiscopal or "water" town, and two suburbs; and is the seat of the Prince Primate of Hungary and an archbishop. The most striking building is the large cathedral (1821–56), in the Italian Renaissance style, with an imposing dome like that of St. Peter's in Rome. The church is 348 feet long, and is the most beautiful in the kingdom. The centre is arched over by a dome 230 feet high, supported by 24 pillars. The interior is adorned with fine paintings, monuments, and chapels, and contains a fine organ by Moser. There are also the church of St. Anne, the old and the new archiepiscopal palaces of the Primate; the seminary for priests, the museum, gymnasium, Catholic girls' school, the county building, and the town hall. The cathedral has a library of 113,000 volumes and many valuable manuscripts. The suburbs are attractively laid out, and have handsome residences. Agriculture is the chief industry, and wine the principal article of commerce. Ironware and bricks are manufactured. Several warm saline and sulphur springs afford medicinal baths. Pop., 1900, 17,909; 1910, 17,881. Esztergom, which is one of the oldest towns of Hungary, was the residence of the Hungarian Prince Gejza; and here was born his son, St. Stephen, first King of Hungary, who was converted to Christianity in 1000, and established the see of Esztergom in 1001. The town was a great commercial centre, but was destroyed by the Tatars in 1241 and never regained its former importance. Between 1543 and 1683 it was held by the Turks.

ESZTERHÁZY. See Esterházy.

ETA, ä'tȧ. See Aëta.

ÉTAMPES, ȧ'täɴp' (Lat. *Stampæ*). The capital of an arrondissement in the Department of Seine-et-Oise, France, 32 miles south-southwest of Paris (Map: France, N., H 4). It contains a number of churches dating from the twelfth and sixteenth centuries, the ruins of a mediæval castle, and an old town hall. It has a college, manufactures woolen fabrics, leather, machinery, and embroidery, and carries on a considerable trade in grain and garden produce. Pop. (commune), 1901, 9001; 1911, 9454.

ÉTAMPES, Anne de Pisseleu, Duchesse d'. See Estampes.

ÉTANG DE BERRE, ȧ'täɴ' *de* bâr. A salt lagoon, or étang, on the south coast of France, situated in the Department of Bouches-du-Rhône, and communicating with the Mediterranean through the Gulf de Foz by a narrow channel, called the Passe des Martigues. It covers an area of about 80 square miles, and its depth varies from 10 to 30 feet. It has important salt works and is of strategic value.

ETAWAH, ḗ-tä'wä. The capital of the district of the same name in the United Provinces, British India, on the left bank of the Jumna, 70 miles below Agra (Map: India, D 3). It is picturesquely situated in a well-wooded district and has some fine streets, a handsome public square, and remains of the Jama Masjid (great mosque), several ghats, or flights of stairs, down to the river for sacred ablution, a great mound, and a ruined fort. It has small manufactures of cotton cloth. It carries on an important trade in ghi, grain, cotton, and oilseed, and owes its prosperity chiefly to its position at the junction of the two roads which lead to Agra from Cawnpore and Kalpi. Pop., 1901, 42,570; 1911, 45,350.

ETCHEMIN, *Fr. pron.* āch'mäN'. See MALECITE.

ETCH'ING (from *etch*, from Dutch *etsen*, from Ger. *ätzen*, to etch, from MHG. *etzen*, OHG. *ezzen*, to give to eat, from *ezan*, Ger. *essen*, Goth. *itan*, AS. *etan*, Eng. *eat;* connected with Ir. *ith*, OChurch Slav. *yami*, I eat, Lat. *edere*, Gk. ἔδεσθαι, *edesthai*, Skt. *ad*, to eat). The art and the process of engraving by means of acid which eats lines in the surface. Etching may be on glass, in which case the line is hard and invariable, and this process is used chiefly by artists who seek character drawing or book illustration in which but little light and shade is desired. It may be done on zinc, which is thought to give a peculiarly rich "color"—i.e., a black and white effect of unusual brilliancy—and for this purpose it is preferred by some modern etchers of landscape subjects. Etchings are known to have been made by Albert Dürer and others on iron, and in modern times on steel, but by far the greater number of plates etched for printing are of copper.

In order that the acid may attack only the parts desired, something which resists the action of the acid must be spread over the plate at the beginning. This is called *the ground;* it is usually varnish of some kind, laid on in a coat thick enough to guarantee its uniformity, so that no small openings will allow a little of the acid to pass through and permit a dot or small blur on the surface. Many special grounds have been used, and one recommended by Hamerton is made of wax, gum mastic, and asphaltum. It is customary then to smoke the surface of this ground, but this is unessential, as its purpose is merely to aid the etcher by allowing him to see his lines as he cuts them, by the contrast of the brilliant metal against the dead black ground of the smoked varnish. The tool by which the lines are drawn may be anything with a reasonably sharp point. J. M. W. Turner used a prong of an old steel fork, which he claimed was as good a tool as any. By far the most usual form of etching needle, however, is a steel bar weighing from one to three ounces, of which the point is made sharp; sometimes both ends are sharpened to points of different fineness. It is to be noted, however, that the needle does not cut the metal at all, but merely scratches through the surface of the varnish so as to expose the metal.

The drawing once made in this manner, the plate is plunged into the acid bath, usually made with nitric acid, diluted by about its own volume of water. The action of this acid is very rapid: it eats the copper away on either side of the line drawn through the ground by the needle, and even hollows out the metal below the surface, leaving sharp, thin edges which break down with great facility. To prevent this and to keep the lines of the width desired, what is called the Dutch mordant was introduced about 1870 and strongly advocated by Hamerton and others. This mordant is composed of chlorate of potash 20 grams, hydrochloric acid 100 grams, water 180 grams. The universal testimony of practitioners is that the bath should be large and deep and contain a considerable quantity of the mordant. Before the plate is put into the mordant it should be brushed with a feather or something of the kind, to clear away from the lines little scraps of the varnish which may have collected there. When it has been laid in the bath, it must still be watched, as bubbles arise that must be removed by a feather or similar means, because they may prevent the free access of the acid to the metal. If, now, it is desired to have a line bitten much deeper than others, it must be exposed for a greater length of time to the acid. For this purpose the process of *stopping out* is employed. The plate is withdrawn from the bath and washed. Varnish is then applied with a brush, filling up ("stopping") those lines which have been bitten sufficiently deep, while the others are once more exposed to the acid. In this way a single plate may be withdrawn several times, more and more of the lines stopped out, and those that remain bitten more deeply. It may also be necessary to rebite the whole plate, as when it is thought, or found on actual trial, that the plate is feeble in effect. For this purpose it is necessary to clean the plate thoroughly and then to put the resistant ground on the plate afresh. This must be done with great care, so as not to fill up the lines already cut by the etching, and then careful examination must be made to see that those thin and shallow lines which have received some part of the ground are cleaned before the revarnished plate is put into the acid bath. Small parts of the plate may, however, be rebitten by the simple means of covering the rest of the plate completely with the ground.

It is not to be forgotten that the dry-point (q.v.) process affords a perfectly ready means of reinforcing the etching without the use of acid. The bur, which is thought to make the special charm of dry point, is not essential, because it can be scraped away with a burnisher so that the lines cut or deepened by the dry point may produce an effect exactly similar to the etched line, and a plate may have been worked all over with the dry point while yet the impressions taken from it do not betray the fact.

When plates are to be finished entirely with etching, or with etching and dry point together, the attention of the artist will be strongly fixed upon the necessity of deepening and strengthening certain parts of his composition. It is for this purpose that stopping out and rebiting and dry-point work are used. When, however, the line engraver uses etching merely as a first preparation for his work, as to lay in the main masses and leading lines of the composition, this etching is usually slight and thin, and as the lines are not intended to show in any published prints, but only in proofs taken for the engraver's use, they may be all of uniform and very slight depth and breadth. The use of etching as a part only of the complete design, the rest being done by the burin, leads to the singularly puzzling style of art which is best seen in the famous plates of Charles Méryon (died 1868)—plates which are usually classed as etchings, but where there are strong evidences of burin work. The recent engravings of the *Chalcographie du Louvre*, reproducing important modern paintings, and such celebrated and admired work as that of Ferdinand Gaillard (died 1887), are instances of work in which the tolerably well-practiced collector can hardly say how much burin work appears.

History. Although etching for purposes of printing appeared in the later fifteenth century, and was practiced by Dürer and others in the sixteenth, it did not attain great importance until the seventeenth. The chief of etchers, so ranked by almost universal admission of those modern artists who have given attention to the matter, is Rembrandt (q.v.). This position he gains not only by superior skill in the technicalities of the art, but even more by the greatness of his design—a design which is, nevertheless, adapted to the medium employed. Among other Dutch painters distinguished in etching were Adriaen van Ostade, Jacob Ruysdael, and Paul Potter. Among Flemish masters Van Dyck excelled especially in portrait heads. In the German school Wenceslas Hollar is one of the greatest masters in etching of the simplest form, with lines of nearly uniform thickness and laid in the simplest manner. Among French masters of the seventeenth century Claude Lorrain etched masterly landscapes, which had a wide influence upon the art, and Jacques Callot excelled especially in genre subjects. Etching declined from the eighteenth century, and in the early nineteenth its chief use was as an aid to engraving. About the middle of the century the revival began. Societies of artists for the publication of etchings were formed in the principal European cities, and an important activity developed, especially in France and in England. The two greatest etchers of the nineteenth century were probably Charles Méryon, whose romantic rendition of architectural subjects never loses its charm, and J. A. M. Whistler, an American of French training, long resident in London. His work is perhaps as important for the nineteenth century as was Rembrandt's in the seventeenth, and as a master of line he is said even to equal the latter. In Great Britain Sir Francis Seymour Haden, who confined himself to landscapes, and Alphonse Legros, a Frenchman, exercised a wide influence. Other important etchers are Sir Charles Holroyd, William Strang, D. Y. Cameron, Frank Brangwyn, and Muirhead Bone, an artist of great power and originality. The number of practicing etchers in France is much larger than in England. It includes such names as Maxime Lalanne, Jules Jacquemart (died 1880), Adolphe Appian, Charles François Daubigny, Paul Rajon, Felix Bracquemond, Martial (Adolphe Martial Potemont), and Paul Helleu; besides many of the prominent painters like Millet, Jacques, Tissot, Besnard, and Raffaelli. In France especially etching was much used in the later nineteenth century for purposes of reproduction, by Flameng and others. Among important modern Belgian etchers was Rops; among Dutch, Gongkind and Storm van's Gravesande. The art also flourishes in Germany and Austria.

In the United States etching has a comparatively recent development. Little was done before the foundation in 1877 of the New York Etching Club, which was followed by similar societies in Cincinnati and Philadelphia in 1880 and in Boston in 1881. A number of the principal painters practiced also as etchers. Owing to the flooding of the market with cheap prints, the interest waned about 1892; but good work continued to be produced, and during the present century there has been a marked revival. Instruction in etching is offered in the principal art schools of the country. The etchers of the Middle West are grouped about the Chicago Society of Etchers. Among the most prominent American etchers are Joseph Pennell, Charles A. Platt, Mrs. Mary Nimmo Moran, Otto Bacher, Herman A. Webster, Ernest P. Roth, Stephen Parrish, and Cadwallader Washburn.

Bibliography. The works of P. G. Hamerton, himself a practical etcher, were of great influence in promoting the art in England; especially his *Etching and Etchers* (London, 1868), republished with photogravure illustrations of great merit (ib., 1880), and in a cheaper edition (ib., 1875). Consult also: Lalanne, *Traité de la gravure à l'eau forte* (Paris, 1866); Hamerton, *Etcher's Handbook* (London, 1881); Haden, *About Etching* (ib., 1881); Koehler, *Etching: An Outline of its Processes and History* (New York, 1886); Hitchcock, *Etching in America* (ib., 1886); Herkomer, *Etching and Mezzotint Engraving* (ib., 1892); Lützow, *Die vervielfältigen Kunste der Gegenwart*, vol. iii, *Die Radierung* (Vienna, 1893); Wedmore, *Etching in England* (New York, 1895); Singer and Strang, *Etching, Engraving, and Other Methods of Printing Pictures* (ib., 1897); Holme, *Modern Etching and Engraving* (London, 1902); Roller, *Die Technik der Radierkunst* (Vienna, 1903); Singer, *Der Kupferstich* (Bielefeld, 1904); Struck, *Die Kunst des Radierens* (Berlin, 1908); Preissig, *Zur Technik der farbigen Radierung und des Farben-Kupferstichs* (Leipzig, 1909); Wedmore, *Etchings* (London, 1911). The subject is also treated, sometimes at length, in the general treatises cited in the bibliography of ENGRAVING. See SOFT-GROUND ETCHING.

ETCHMIADZIN, ĕch'mē-ȧd-zēn'. A famous Armenian monastery, situated in the District of Etchmiadzin in the Transcaucasian Province of Erivan, 12 miles west of Erivan, adjacent to the village of Vagarshapat (Vagharshapad). It consists of a number of buildings, divided into three parts, each surrounded by a strong brick wall, which gives them the appearance of fortresses. The church of Shoghakath, whose foundation is attributed to St. Gregory, is a cruciform edifice, with a Byzantine cupola and mural decorations in Persian style. Other noteworthy churches are those of St. Ripsime and St. Gaine. Besides the churches there are attached to the monastery a theological academy, a printing press, and a library with valuable Armenian manuscripts.

The monastery has been the seat of the Armenian Primate since 1441, and is now also the seat of the Armenian Holy Synod organized since the Russian occupation. The site of Vagarshapat was occupied by the famous town of Etchmiadzin, founded, according to local tradition, by King Eruand I in the sixth century B.C. It was fortified by King Vagharsh in the second century A.D. and became the capital of a province. The monastery was founded in the sixth century; the church of Shoghakath, however, dates from the fourth century. In 1827, during the Russo-Persian War, the monastery was occupied by the Russians, and by the Treaty of Turkmantchai (1828) it was formally ceded to Russia.

ETE'OCLES and **POL'YNI'CES** (Lat., from Gk. 'Ετεοκλῆς, of true fame, from ἐτεός, *eteos*, true + -κλης, *-klēs*, from κλέος, fame; Πολυνείκης, of much strife, from πολύς, *polys*, much + νεῖκος, *neikos*, strife). Sons of Œdipus (q.v.) and Jocaste. Cursed by their father for unfilial conduct, they quarreled over the inheritance, and Eteocles drove Polynices from Thebes. According to one version they agreed to reign in alternate years, but at the end of the first year Eteocles refused to resign his power. Polynices, resolved on revenge, fled to the court of Adrastus, King of Argos, whose daughter he married, and whom he induced to join him in a war against Thebes. The war that followed is known as that of the "Seven against Thebes" and played a part in the early Greek epic second only to that played by the Siege of Troy. The names of the "Seven" were Adrastus, Amphiaraus, Tydeus, Parthenopæus, Capaneus, Polynices, and either Mecisteus or Hippomedon. In the battle before Thebes the brothers met and killed each other. Eteocles was buried with honor, but Polynices' body was left unburied until the last rites were performed by his sister Antigone (q.v.). The story forms the basis of *The Seven against Thebes* by Æschylus and of the *Phœnissæ* by Euripides. It is also noticed in the *Œdipus at Colonus* of Sophocles and in the *Suppliants* of Euripides. Consult Bethe, *Thebanische Heldenlieder* (Leipzig, 1891). See also Amphiaraus; Epigoni.

ETER'NAL CITY, The. A term applied to Rome, which was known even in antiquity as *Roma Immortalis*. Also the title of a novel by Hall Caine (1901). Consult F. G. Moore, "On *Urbs æterna* and *Urbs sacra*," in *Transactions American Philosophical Association*, vol. xxv (1894).

ETERNAL PUNISHMENT. See Hell.

ETERNITY, Cape. See Cape Eternity.

ETESIAN (ê-tē'zhan) **WINDS** (Gk. *ἐτήσιος*, *etêsios*, annual, from *ἔτος*, *etos*, year, Lat. *vetus*, old, Skt. *vatsara*, year). The north and northeast winds that prevail in southern Europe in the summer season, apparently due principally to an indraft towards the heated portion of the African Sahara. They extend across the Mediterranean towards North Africa and are strongest in July and August.

ÉTEX, ā'tĕks', Antoine (1808–88). A French sculptor and painter, born in Paris. He studied painting under Ingres, sculpture under Dupaty and Pradier, and architecture under Duban. After exhibiting in 1839 the remarkable group "Cain and his Race Cursed by God" (now in Lyons), which excels his later works in boldness and simplicity, he received the order for the two groups of "Peace" and "Resistance" on the Arc de l'Etoile. Though his versatility led him into other lines of art, he gained celebrity only as a sculptor. His works, which are in the classical style of David's school, are bold and startling in composition, but lacking in harmony, exaggerated in action. The best-known paintings are "Eurydice," which was in the Luxembourg Gallery, and "The Glory of the United States," in the City Hall, New York. The most noted of his funeral monuments is that of the painter Géricault in the cemetery of Père-Lachaise, Paris, which in 1841 brought him the cross of the Legion of Honor. He wrote: *La Grèce tragique* (1847), with 44 etched plates; *Cours élémentaire de dessin* (1855–59), with 50 lithographed plates; and various notices on painters for reviews.

ETHANE, ĕth'ān (from *ether*), C_2H_6. A gaseous compound of carbon and hydrogen, similar to marsh gas. It is one of the constituents of the natural gas rising from the earth in petroleum districts. Like marsh gas, it is colorless and odorless, and insoluble in water. It is found dissolved in crude petroleum. It burns with a pale flame, having greater luminosity, however, than the marsh-gas flame, owing mainly to the fact that ethane contains a greater percentage of carbon than marsh gas. Ethane can be more readily liquefied than marsh gas. A mixture of ethane and air is highly explosive, especially if the amount of air present is just sufficient to burn up all of the organic gas. By gradually substituting chlorine, bromine, or iodine for the hydrogen of ethane, the so-called halogen derivatives of this hydrocarbon may be obtained. One of these—viz., ethyl iodide (C_2H_5I)—is used for the preparation of pure ethane, according to the following reaction:

$$\underset{\text{Ethyl iodide}}{C_2H_5I} + \underset{\substack{\text{Nascent}\\ \text{hydrogen}}}{2H} = \underset{\text{Ethane}}{C_2H_6} + \underset{\substack{\text{Hydriodic}\\ \text{acid}}}{HI}$$

Another method of preparing ethane consists in causing metallic sodium to act upon methyl iodide, the products being ethane and sodium iodide.

ETHÉ, ā'te (Karl) Hermann (1844–). A German Orientalist, born in Stralsund, grandson of the Pomeranian poet Karl Lappe. He was educated at the universities of Greifswald and Leipzig and became in 1867 privatdocent of Arabic, Turkish, and Persian at Munich. In 1872 he went to Oxford University to catalogue various Oriental manuscripts in the Bodleian Library (first volume published in 1889); and in 1875 he was called to University College, Aberystwyth, Wales, as professor of German and Oriental languages. He catalogued Persian manuscripts in the India office library (vol. i, 1903), edited a critical text of Ferdausi's *Yûsuf and Zalîkhâ* (1908), and wrote on Persian literature and related topics for the *Athenæum*, the *Encyclopædia Britannica*, and the Strassburg *Grundriss der iranischen Philologie*.

ETH'ELBALD, or **ÆTHELBALD** (?–757). King of the Mercians (716–757), a son of Alweo. He succeeded Ceolred in 716, and in 731 was acknowledged as overlord by all the kings and peoples of southern and central England as far as the Humber. He ravaged Northumbria in 740 and waged a successful war against the Welsh in 743, but was defeated by Cuthred, the West Saxon King, at the battle of Burford in 752. He was probably killed by his own guards.

ETHELBALD, or **ÆTHELBALD** (?–860). A king of the West Saxons. He was the son of Ethelwulf (q.v.) and a brother of Alfred the Great. He is said by Asser to have formed a conspiracy to seize his father's throne in 856 and to have dispossessed him of Wessex. After Ethelwulf's death (858) Ethelbald married his young stepmother, Judith. His reign was peaceful and uneventful. Consult Oman, *England before the Norman Conquest* (New York, 1910).

ETH'ELBERT, or **ÆTHELBERHT** (c.552–616). King of Kent from 560 to 616. After the death of Ceawlin, King of the West Saxons, in 593, Ethelbert established his supremacy over all the English south of the Humber and was acknowledged as Bretwalda. Ethelbert married Bertha, daughter of Charibert, King of the Franks, who was a Christian, and who stipulated that his daughter should be allowed to practice her own religion. The conversion of Ethelbert was effected by St. Augustine (q.v.) in 597. After his conversion and baptism he founded the bishopric of Rochester, and in concert with his nephew, Saeberht, King of Essex, who also had been converted, erected the church of St. Paul in London. He died Feb. 24, 616. Ethelbert is also known as the author of the first written Saxon laws. Consult: Haddan and Stubbs, *Councils and Ecclesiastical Documents Relating to Great Britain and Ireland*, vol. iii (Oxford, 1871); Oman, *England before the Norman Conquest* (New York, 1910); Hodgkin, *History of England to the Norman Conquest* (ib., 1906).

ETHELBERT, or **ÆTHELBERT** (?–866). King of Wessex and of Kent. He was the third son of Ethelwulf, King of the West Saxons, and about 855 became Underking of Kent, succeeding to the throne of Wessex in 860. During Ethelbert's reign the southern coasts of England were ravaged by the Danes and by pirates from Gaul, Winchester being sacked by the former.

ETHELFLEDA, ĕth′ĕl-flē′dȧ, or **A'ETHELFLA'ED**, ăth′ĕl-flăd (?–A.D. 917). The eldest daughter of Alfred the Great, called the Lady of the Mercians. She married Ethelred, Earl of Mercia, about 880, and the two exercised almost royal power in their territories. They conducted various expeditions against the Norwegians and other pagans who threatened their realms. After the death of her husband in 911, or 912, she sent an expedition against the Welsh in 916 and captured Derby (917) and Leicester (918) from the Danes. Consult Green, *Conquest of England* (New York, 1884).

ETH′ELRED, or **ÆTHELRED, I** (?–871). A king of the West Saxons and of the men of Kent. He succeeded his brother Ethelbert in 866. His reign was greatly disturbed by the invasions of the Northmen, who now began to found kingdoms instead of making merely piratical forays. Many indecisive battles were fought by Ethelred, aided by his brother Alfred the Great (q.v.).

ETHELRED, or **ÆTHELRED, II** (c.968–1016). King of the English from 978 to 1016, known as the Unready. He was the son of Edgar and Elfrida. In the beginning of his reign he showed himself by no means slothful or incapable, the surname "Unready" referring to his lack of *rede*, or counsel. His reign was marked by almost continuous warfare with the Northmen. In 980 the Danes began to plunder the coasts; in 991 they forced Ethelred to purchase peace, and in 994, aided by Olaf, King of Norway, they laid siege to London. The city was saved, however, through the valor of its inhabitants. The Danes then attacked the southern coasts, but they were hindered by the defection of Olaf, who embraced Christianity and became Ethelred's ally. In the last three years of the tenth century the Danes ravaged Kent, Sussex, and Wessex. In 1000 the Anglo-Saxon King invaded Normandy and was disastrously defeated; but he made a treaty with Duke Richard II and married his sister Emma. In the spring he concluded a treaty with the Danes; but, on the pretext that they were plotting treachery, he ordered, in 1002, the murder of all the Danes in England on the same day—November 13. Among the victims was probably Gunhild, sister of Sweyn, King of Denmark. Sweyn was swift in his revenge, and for four years his army ravaged in England almost at pleasure. In 1007 Ethelred bought peace for a large sum of money. In 1009 he collected a large fleet, but it was almost wholly destroyed by a storm; the Danes renewed their ravages, and the English suffered many defeats, until another peace was purchased for money in 1012. The next year Sweyn, with the largest fleet he had ever collected, sailed up the Humber and marched towards London; but he met with such strong resistance that he gave up the plan of attacking the city and turned off to Bath, where he was proclaimed King of England by the people, who were weary of Ethelred's incompetency and exactions. London soon acknowledged Sweyn, and Ethelred fled to Normandy. Sweyn died in the spring of 1014, and Ethelred was recalled on promising to rule better in the future. In the same year he defeated Canute (q.v.), son of Sweyn, but in 1015 Canute returned from Denmark, ravaged a large territory, and was about to attack London when Ethelred died. Ethelred married Emma, daughter of Richard the Fearless of Normandy; their oldest son was Edward the Confessor. Consult: Freeman, *The Norman Conquest*, vol. i (New York, 1873); Hodgkin, *History of England to the Norman Conquest* (ib., 1906); Oman, *England before the Norman Conquest* (ib., 1910).

ETH′ELRE′DA, Saint, or **ÆTHELTHRYTH** (c.600–679). A princess of East Anglia, canonized for her saintly virtue. She was born at Exning, or Oxning, Suffolk, the daughter of Anna, King of East Anglia. She was twice married, but each time refused to consider the marriage as more than nominal. She finally became a nun and abbess of Ely, where she died June 23, 679. Her name was popularly abbreviated or corrupted into St. Audrey.

ETH′ELWULF, or **ÆTHELWULF** (?–858). King of the West Saxons and of the men of Kent. He was the son of Egbert (q.v.), whom he succeeded about 839. During his reign the Danes repeatedly attacked the coasts of Wessex and Kent, but Ethelwulf left the defense usually to his officers. In 855 Ethelwulf made a journey to Rome, where he remained about a year. On his homeward journey he married Judith, daughter of Charles the Bald of France. On arriving in England he found that his son Ethelbald (q.v.) had usurped the throne of Wessex. Ethelwulf made no attempt to recover the crown, but remained content with the kingship of Kent which his son left to him. The youngest of his five children was Alfred the Great (q.v.).

E′THER (Lat. *æther*, Gk. *αἰθήρ*, *aithēr*, upper air, from *αἴθειν*, *aithein*, to glow, Skt. *idh*, to kindle). It may be regarded as proved that the sensation light is due to wave motion, and that all the thermal effects attributed to "radiation" are due to the absorption of waves. A train of waves is the advance into a medium of a periodic disturbance; and therefore a medium is required for the waves which produce luminous and thermal effects. This medium is called the "luminiferous ether," or, more simply, "the ether." The medium which was imagined by Faraday as a necessary part of his theory of electric and magnetic actions has also been identified by Maxwell with the ether. The fact that the ether is distinct from ordinary matter as known to us is shown by the transmission of radiation through interstellar space and through vacua, as well as by the magnitude of the velocity of such waves—3×10^{10} centimeters, or about 186,000 miles, per second—which is greater than would be possible with any matter of properties comparable with ordinary matter. The ether has inertia, because time is required for the propagation of waves; but there is no evidence that it has weight. In fact, the passage of radiation through all bodies, to a greater or less degree, proves that the ether is a medium permeating all space, and that portions of ordinary matter, i.e., molecules and atoms, are immersed in it, as particles of dust float in the air, or small solid particles exist in water. The lengths of ether waves may be measured by suitable means (see Light); and those that appeal to physical instruments are found to vary from many miles to less than two-millionths of a millimeter. If waves as short as these last are propagated in a medium, it shows that the structure of that medium must be extremely minute, its portions—if there are any—being much smaller than the smallest wave length known; otherwise waves as short as these could not be produced. Nothing of the actual structure of the ether is known; but from analogy with matter its "elasticity" and "density" are spoken of, simply meaning those properties of restitution and inertia by virtue of which waves may be transmitted. These waves are transverse, meaning that, whatever the disturbance is, it is perpendicular to the direction of propagation. This shows that the ether must have properties analogous to the material properties of an elastic jelly, because the only form of matter which can carry transverse waves is one with rigidity. It should be observed that some forms of matter behave like solids for sudden forces, but like fluids for slow ones; thus, shoemaker's wax is brittle for quick blows, but a piece of lead put on top of the wax will in the course of time pass through, the wax flowing around it.

Waves in the ether are produced by electric oscillations, and they are emitted also by all forms and conditions of matter (see RADIATION); and the statement that these waves have identical properties—except as to wave number—is the so-called "electromagnetic theory" of light. The phenomena of radiation and absorption prove that if a minute portion of matter—an electron—is vibrating extremely rapidly, it produces waves in the ether. This establishes the fact that there is some connection between ether and ordinary matter in this case. Whether a large piece of matter moving with motion of translation drags the ether with it, or simply allows the ether to pass through it—like wind through a tree—is still to a certain extent an open question. There is, however, no decisive experimental fact in favor of the idea that the ether is dragged along, except in the experiments of Michelson and Morley to be referred to later. The accepted theory is that the ether is not affected by the passage of matter through it unless the matter is electrically charged.

It has been shown by Fizeau and by Michelson and Morley that a beam of light is accelerated by its passage through a current of water moving in the direction of the beam and retarded by an opposing current. This can be explained on the hypothesis of Fresnel that, in addition to the free ether which exists equally everywhere, there is in any transparent body an amount of ether $n^2 - 1$ times that of the free ether occupying the same volume, n being the index of refraction, and that this extra amount of ether is attached to the body and moves with it. On this hypothesis the density of the ether in the body is therefore n^2 times that of the ether in free space, meaning by density that property of the medium which measures its inertia. On the other hand, Lorenz has explained the observed facts on a simple theory of a stationary ether.

The phenomena of stellar aberration (q.v.) seem to prove that the ether near the earth must be independent of the earth's motion, or at least that there should not be produced in it what is called in hydrodynamics "rotational" motion. On the other hand, Michelson and Morley have shown that the ether near the surface of the earth moves with at least very nearly the velocity of the earth, assuming that their apparatus is not affected by the motion. Lodge, however, has performed most careful experiments from which he concludes that the velocity of light between two steel plates moving together in their own planes an inch apart is not altered by an appreciable quantity. It is extremely difficult to reconcile these experimental results; and there are many others, equally confusing. Fitzgerald and Lorenz have shown that, in order to explain them, it is necessary to assume that the dimensions of solids change as they move through the ether.

It is thus seen that, in order to connect the phenomena of mechanics, light, and electricity, the assumption of the existence of the ether has been made. Upon this is based the modern mathematical theory of physics; and, combining this with the hypothesis of Fitzgerald and Lorenz referred to above, a system of equations has been deduced which is, on the whole, in wonderful agreement with observed facts. It should be noted, however, that within recent years a school of mathematicians, headed by A. Einstein, has shown that starting with a few hypotheses—not themselves based upon experiments—it is possible to deduce the same, or equivalent, equations which are in accord with actual observations. This theory of "relativity," as it is called, does not postulate the existence of the ether.

The fundamental differences between the two points of view of nature lies in this: the classical authorities explain phenomena in terms of ideas which are connected with our senses and with our ordinary conception of matter; the followers of Einstein, on the other hand, have developed equations which are founded upon purely mathematical postulates.

Bibliography. The subject of the ether is one that presents many difficulties; and while much has been written in this connection, it is not always in a shape to be of assistance to the average reader. Consult, however: Larmor, *Æther and Matter* (London, 1901); Lodge, "Aberration Problems," in *Philosophical Transactions* (ib., 1892–93); id., in *Philosophical Transactions* (ib., 1897); Larmor, "Dynamical Theory of the Electric and Luminiferous Ether," in *Philosophical Transactions* (ib., 1894, 1898); Michelson and Morley, in *Philosophical Magazine*, vol. xxiv (ib., 1887); Lorenz, *Versuch einer Theorie der elektrischen und optischen Erscheinungen in bewegten Körpern* (Leyden, 1873); Wien, *Referat, 70. Versammlung deutscher Naturforscher und Aerzte in Düsseldorf* (Düsseldorf, 1898); Mie, *Moleküle, Atome, Weltäther* (Leipzig, 1904); Ames, *The Constitution of Matter*, (Boston, 1913). For papers on relativity, consult papers by Einstein in *Annalen der Physik*, (1904–14). See ENERGETICS.

ETHER, or more properly DI-ETHYL-ETHER, $(C_2H_5)_2O$, also called "sulphuric ether." A substance composed of carbon, hydrogen, and oxygen. At ordinary temperatures it is liquid; if chemically pure, it boils somewhere between 34.4° and 35.0° C. (93.9° and 95.0° F.), and its specific gravity at 0° C. is 0.736. The critical temperature and pressure of ether may be found under CRITICAL POINT. Ether is sparingly soluble in water, but mixes in all proportions with alcohol, chloroform, acetone, carbon disulphide, and other organic liquids. It is an excellent solvent for fats, oils, resins, many alkaloids, and certain organic salts, including mercuric chloride (corrosive sublimate) and the chlorides of iron and copper. The collodion used in photography is a solution of certain nitrates of cellulose in a mixture of alcohol and ether. Ether is also used in the preparation of fats and in determining the amount of fat in samples submitted for analysis (see FATS); it is likewise employed for removing grease spots. Its vapors are extremely inflammable, and therefore it should under no circumstances be used in the neighborhood of artificial lights. It is very volatile and has a characteristic pleasant odor and a burning sweetish taste. Ether is made on a large scale by the action of strong sulphuric acid on ordinary alcohol. The chemical transformation takes place in two steps: first ethyl-hydrogen sulphate, $C_2H_5HSO_4$, is formed:

$$\begin{array}{ccccccc} H_2SO_4 & + & C_2H_5OH & = & H_2O & + & C_2H_5HSO_4 \\ \text{Sulphuric acid} & & \text{Alcohol} & & \text{Water} & & \text{Ethyl-hydrogen sulphate} \end{array}$$

Ethyl-hydrogen sulphate is then converted into ether by the further action of alcohol, according to the following chemical equation:

$$\begin{array}{ccccccc} C_2H_5HSO_4 & + & C_2H_5OH & = & (C_2H_5)_2O & + & H_2SO_4 \\ \text{Ethyl-hydrogen sulphate} & & \text{Alcohol} & & \text{Ether} & & \text{Sulphuric acid} \end{array}$$

Sulphuric acid is evidently regenerated in this transformation, and therefore the addition of acid for the production of a new quantity of ether would seem unnecessary, and ether might be said to be manufactured by a *continuous process*, a given quantity of sulphuric acid being capable of transforming an indefinite amount of alcohol. In reality, however, the acid must be rejected after the operation has been carried on for a certain length of time, owing to the formation of water and sulphurous acid during the process. The distillation is carried out in appropriate apparatus, the distilling reservoir being kept at a temperature of 140° to 150° C. At higher temperatures much ethylene gas is produced, and also, the higher the temperature, the greater the proportion of alcohol altogether carbonized by the sulphuric acid. The crude ether obtained at first contains more or less alcohol and sulphurous acid. It is purified by shaking with a solution of lime in water, the water taking up the alcohol, while the lime combines with the acid impurity. The ether is then dried with anhydrous calcium chloride and redistilled. By the use of metallic sodium, or perhaps preferably of phosphorus pentoxide, ether may be rendered absolutely free from water; sodium frees it also from alcohol. Chemically ether is a rather indifferent compound; with certain substances, however, it reacts very energetically; thus, if brought into contact with chlorine, it is rapidly decomposed with formation of aldehyde, chloral, hydrochloric acid, etc., the ether often taking fire during the reaction.

The ether used for surgical purposes contains a small amount of water and alcohol; its specific gravity varies between 0.725 and 0.728. The preparation known as Hoffmann's anodyne is composed mainly of ether and alcohol. In medicine ether is sometimes used as a local anæsthetic, producing intense cold when evaporated; if injected subcutaneously, it rapidly acts as a stimulant on the heart and respiration, and is therefore highly valuable in fainting. In America it is esteemed a safer general anæsthetic than chloroform and is therefore extensively used in surgery. Its action is similar to that of chloroform, the highest functions of the organism being affected first, the lowest last (law of dissolution). The stage of stimulation, however, lasts considerably longer than in chloroform anæsthesia. The administration of ether is somewhat more difficult than that of chloroform, and it is liable to have an irritating effect on the kidneys and to increase bronchitis in patients suffering from it. Within recent years the practice has been introduced of using a certain amount of laughing gas immediately before inducing complete anæsthesia by means of ether. In this manner certain disagreeable after effects of ether anæsthesia may be completely abolished. To make the administration of ether safer and less disagreeable various expedients have been practiced. The quantity necessary for a given anæsthesia can be materially reduced by giving a preliminary hypodermic injection of morphine, or morphine and scopolomine. The nauseating effects of the drug are sometimes lessened by flavoring it with oil of orange or other pleasant-smelling aromatic oil. Another method, more favored by European than American surgeons, is transfusing ether, largely diluted with normal saline solution, directly into the veins. It has also been injected into the muscles. The latest expedient to be tried in this country is the oil and ether rectal method, by which the anæsthetic, mixed with olive oil, is given as a high enema into the lower bowel. Intratracheal insufflation, in which small quantities of ether are sprayed directly into the trachea, is a difficult but useful method. (See ANÆSTHETIC.) On the other hand, the after effects of ether are said not to appear at all, if the anæsthetic is only thoroughly freed from its usual impurities. Ether is the earliest-known anæsthetic and was extensively used in Europe before the introduction of chloroform. It was discovered probably as far back as the thirteenth century. For a long time it was supposed to contain sulphur, and hence the name "sulphuric ether" was applied to it. Its true composition was established by Saussure (1807) and by Gay-Lussac (1815). Later Williamson explained its formation and chemical constitution. Since the middle of the nineteenth century it has, unfortunately, been used in Ireland and elsewhere as an intoxicant. The effects are somewhat similar to those of opium: digestion is impaired, the heart becomes irregular, and gradually nervous exhaustion and general weakness are produced; the weakness of the body is followed by weakness of the will, hallucinations, and mental confusion.

ETHEREAL SALTS. See ESTERS.

ETH′EREGE, or ETHRYGG, GEORGE. An English classical scholar, born in Oxfordshire. He was educated at Corpus Christi College, Oxford, where he was professor of Greek from 1547 to 1550 and from 1554 to 1559. He also received the title of bachelor of medicine and was licensed to practice, and this profession he followed after the loss of his professorship, due to his Catholic sympathies, soon after the accession of Elizabeth. He was the author of a translation of certain of the works of Justin Martyr, a Greek poem on the deeds of Henry VIII, and a volume of Latin poems; and he set to music the Psalms of David, in the original Hebrew.

ETHEREGE, SIR GEORGE (?1635–c.1691). An English dramatist, born in Oxfordshire. There is some reason to suppose that he spent a short time at Cambridge and traveled subsequently on the Continent, where he acquired a gentleman's knowledge of French. His first comedy, *The Comical Revenge, or Love in a Tub*, was produced in 1664, with remarkable success, and gained its author the patronage of the court. In 1667 came *She Would if she Could*, which also achieved success and was followed in 1676 by Etherege's last play, *The Man of Mode, or Sir Fopling Flutter*. The play owed its favorable reception, in the main, to the fact that its characters were faithfully drawn from well-known men of the time. Etherege was one of the best-known libertines of the day and a boon companion of the notorious Sir Charles Sedley. After receiving knighthood he was given a diplomatic charge on the Continent, and in 1685 was English representative at Regensburg, where he aroused intense dissatisfaction by his licentious conduct. He died in Paris. Editions of his plays appeared in 1704, 1715, and 1735. His works were edited, with an introduction, by Verity (1888). Consult an essay by Gosse in *Seventeenth Century Studies* (London, 1895) and *Cambridge History of English Literature* (New York, 1907–13).

ETH'ERIDGE, John Wesley (1804–66). An English Wesleyan Methodist clergyman and scholar, born on the Isle of Wight. Entering the ministry in 1827, he occupied Brighton and Cornwall circuits, and for several years was pastor of a church at Boulogne, France. He became a noted Hebrew and Syriac scholar. His works include: *The Apostolic Ministry and the Question of its Restoration Considered* (1836); *Misericordia, or Contemplations of the Mercy of God* (1842); *Horæ Aramaicæ* (1843); *The Syrian Churches: Their Early History, Liturgies, and Literature* (1846); *The Apostolical Acts and Epistles from the Peschitto, or Ancient Syriac, to which are Added the Remaining Epistles and Book of Revelation from a Later Syriac Text* (1849); *Jerusalem and Tiberias; Sora and Cordova: A Survey of the Religious and Scholastic Learning of the Jews* (1856); *The Life of Thomas Coke, D.C.L.* (1860); *The Targums of Onkelos and Jonathan ben Uzziel on the Pentateuch; with the Fragments of the Jerusalem Targum* (2 vols., 1862, 1863); *The Life of the Rev. Adam Clarke* (1858). Consult the *Memoir* by Thornley Smith (London, 1871).

ETHERIDGE, Robert (1819–1903). An English paleontologist, born at Ross, Herefordshire. In 1850 he was appointed curator of the museum of the Bristol Philosophical Institution. He became assistant paleontologist in 1857 and paleontologist in 1863 of the Geological Survey. From 1881 to 1891 he was assistant keeper in geology of the British Museum, and from 1865 to his death he was an assistant editor of the *Geological Magazine*. He became a fellow of the Royal Society in 1871 and served as president of the Geological Society in 1881–82. Besides publishing several important essays and a *Catalogue of Fossils in the Museum of Practical Geology*, with Huxley (1865), and revising the second edition of part ii of Phillip's *Manual of Geology* (1887), he prepared an elaborate catalogue of the *Fossils of the British Islands, Stratigraphically and Zoölogically Arranged*, of which only vol. i was published (1888).

E'THERS. An important class of carbon compounds related to the alcohols (q.v.). Their relation to the alcohols is analogous to the relation of the metallic oxides (like K_2O) to the metallic hydroxides (like KOH). Thus, while the composition of ordinary ether (the liquid used for anæsthesia during surgical operations) is represented by the formula $(C_2H_5)_2O$, the composition of ordinary alcohol is C_2H_5OH. While, therefore, an alcohol may be defined as a hydroxide of a hydrocarbon radicle (like methyl, CH_3, or ethyl, C_2H_5), an ether may be defined as an *oxide* of such radicles. The close relationship existing between ethers and alcohols is shown by the readiness with which the former may be prepared from the latter. Thus, ordinary ether is usually made by the action of sulphuric acid upon alcohol. (See Ether.) Another method by which ethers may be prepared is very ingenious and serves to demonstrate clearly their chemical constitution. It consists in treating a halogen derivative of a hydrocarbon, such as ethyl chloride, ethyl bromide, or ethyl iodide, with the sodium compound of an alcohol. Ethyl iodide is represented by the formula C_2H_5I; sodium alcoholate, by the formula $NaOC_2H_5$. Since sodium (Na) has a great affinity for iodine (I), the iodide and the alcoholate will, on being mixed, readily enter into chemical reaction, by virtue of which a transformation will take place that can be represented only by the following scheme, which leaves no doubt as to the constitution of the ether molecule:

$$\underset{\textbf{Ethyl iodide}}{C_2H_5I} + \underset{\substack{\textbf{Sodium}\\ \textbf{alcoholate}}}{NaOC_2H_5} = \underset{\substack{\textbf{Sodium}\\ \textbf{iodide}}}{NaI} + \underset{\textbf{Di-ethyl ether}}{C_2H_5.O.C_2H_5}$$

Ethers are usually subdivided into *simple* and *mixed*. The two hydrocarbon radicles in a simple ether are identical; in a mixed ether they are different. Thus, ordinary ether is a simple ether, its formula being $(C_2H_5)_2O$. On the contrary, methyl-ethyl ether, represented by the formula $CH_3.O.C_2H_5$, is a mixed ether. Mixed ethers may be prepared by the same methods as simple ethers. Thus, methyl-ethyl ether may be obtained either by treating a mixture of methyl alcohol (wood alcohol) and ordinary (ethyl) alcohol with sulphuric acid, or, preferably, by treating sodium methylate ($NaOCH_3$) with ethyl iodide (C_2H_5I).

The ethers are, as a rule, very stable compounds, not readily affected either by dilute alkalies or acids. Most of them are light, volatile, inflammable liquids, insoluble in water, but readily soluble in the alcohols. The most typical and useful compound of the class is ordinary ether. The chemical constitution of the ethers was first elucidated by Williamson in 1855.

The term *compound ethers* is sometimes applied to another class of compounds, which are, however, at present usually termed esters, or ethereal salts. See Esters.

ETH'ICAL CULTURE SOCIETY. See Societies for Ethical Culture.

ETH'ICS (Gk. *τὰ ἠθικά, ta ēthika*, or *ἡ ἠθική, hē ēthikē*, ethical science, from *ἦθος, ēthos*, custom, habit). The science of morality. The term "ethics" is frequently used in popular speech as the synonym of morality or of a particular moral code current in some circle or profession, as when we speak of medical ethics. But it is preferable to confine the term "ethics" to the description of a theory of morality. Morality is an art; i.e., it is a way of living and of doing. Ethics is the attempt scientifically to understand this way of living and acting. In the definition given above the subject matter of ethics is stated to be morality. It is important to notice that ethics does not presume to construct morality out of whole cloth. Like any other science, it deals with actual phenomena that exist before the science comes into being. If there were no such thing as morality in the world, if men had not a consciousness of obligation, did not feel the attractive power of moral ideals, and did not find satisfaction in the realization of these ideals, there would be no ethics, any more than there would be mineralogy in a nonmineral world. But since morality is as indubitable a fact as crystallization, it piques curiosity to the comprehension of it. Among the questions that arise are the following: What is morality? Is it explicable as a result of evolution? When thoroughly understood in its fundamental features and in its historical development, is it seen to be a reasonable fact, or is it a prejudice to be outgrown or an infantile way of behaving, to be put away with many other childish things, when once we arrive at the age of discretion? If it is something of permanent value, is there any way in which its value may be enhanced?

It is necessary to be on our guard when we come to ask what morality is. The question is often confused with that other question, What ought morality to be? This latter question, however, cannot be answered till the former is answered, any more than the question what ought a healthy man to be can be answered till we know what actual health really is. The morality of a certain man, or of a certain people, or of a certain time, is itself amenable to a higher standard of morality only in the sense that actual empirical healthfulness is amenable to a higher standard, idealized from experienced health. But what is that standard? Here we come to a point concerning which there is a fundamental difference of opinion. Some say the standard is God's will (theological voluntarism); some that it is pure reason (rationalism); some that it is pleasure, either of the individual or of a community of individuals (hedonism, egoistic and universalistic); some that it is perfect biological adaptation to the environment (biologism); some that it is perfection, variously defined, of the individual or of the race (perfectionism, the ethics of self-realization). In view of this difference of opinion, it seems impossible to answer offhand the question what morality ought to be. But the question what morality is and has been is more hopeful. Although the moral consciousness is anything but simple, still it is open to study and description.

In the first place, the form or type of moral consciousness we are best acquainted with is one that is capable of appreciating an antagonism between two or more motives. If there were never a competing desire standing out against the course eventually adopted, or, to use the language of religious experience, if there were no temptations, there would be no morality such as we know. This feature will be discussed below.

The second characteristic of mature moral consciousness is that without the capacity for self-consciousness it could not exist. The motives in the moral consciousness are not merely desires for this and that object, but desires which may be considered by the agent as indicating his own character. The significance of this feature of morality can be brought out better by comparing the consciousness of a presumably nonmoral being with that of a moral being. A cat may desire a warm berth on a bed and may be averse to the slapping that comes to her when caught on the bed. But, so far as we know, while the cat has desires and aversions, she does not think of *herself* as a being whose conduct can be discriminated from that of other beings. Her attention is turned upon the things she wants; it is not directed upon herself as wanting these things. Though she has a distinctive nature, for herself this nature is not an object of contemplation, as man's own nature becomes for him at times a character reflected upon.

A third characteristic of moral consciousness is that the idea of self as doing or being has an emotional and motive value. It attracts or repels. Not only does the moral agent have at times the idea of himself as doing this thing or not doing it, but he likes or dislikes himself when he thinks of himself as doing or not doing some particular thing. Such an idea of self which attracts the agent to realize it in act is called an ideal self.

The definition of a moral agent as an agent with an ideal self as an end which excites desire, and enters into competition with other ends, leaves out of account the social nature of morality, the fourth characteristic to be mentioned. The ideal, to be ethical, must be a social ideal. That is, the idea of self which is the end of action is in morality and immorality the idea of a self in essential relation to other selves. Man, as Aristotle wisely observed, is by nature a social animal, and human morality is social to the core. Whether any other morality is possible is not here in question. In all probability self-consciousness develops only as a reflection from the consciousness that others have of us. Our attention is directed to ourselves only after we have observed others paying attention to us. And the self we thus reflect upon takes its emotional coloring and motive value from the attitude our fellows take towards us. Because, then, the moral agent is a self-conscious being in a social environment, morality is social; and when we say that it is social, we say that it is not a matter of the individual's arbitrary construction. He does not choose his ideal entirely at his good pleasure. He finds a general ideal in the society into which he is born and in which he is reared, and this ideal forms at least the point of departure for his own mature ideal. There are certain things expected of a member of society, and this expectation forms a nucleus around which the individual ethical development proceeds. The moral man does not break away completely from these traditions. The moral man is one who is "centred in the sphere of *common* duties."

Another feature of morality needing mention is that these common duties have in most cases a real or assumed reference to the welfare of the community. The obvious reason for the condemnation of murder, adultery, rape, theft, lying, cowardice, and intemperance, to mention some of the most prominent objects of moral judgment, is that these acts are injurious to society. The murderer, the adulterer, the ravisher, the thief, the liar, the coward, and the intemperate are common enemies, and the disapproval they receive is, at least in part, the natural reaction of society against its foes. That in great measure morality is action really or supposedly conducive to social welfare, and immorality is action really or supposedly conducive to social degeneration, is proved by the fact that actions once regarded as ethically indifferent come to be regarded as moral or immoral when the general opinion comes to regard them as socially beneficial or injurious. The gradual change in the moral status of slavery, of concubinage, of general sexual laxity in men, of the duel and the vendetta, is historically traceable to growing insight into the social consequences of these practices. The process of the moralization of formerly ethically indifferent acts is observable in our own day. In many places lynching is morally justified by the community at large. The mob law exercised on some dastardly criminal is considered moral because it not only "serves him right," but also is supposed to protect society against future outrages. But when it is seen that such protection does not protect, but tends to undermine the very foundation of law and thus render society insecure, a sentiment grows that lynching is morally wrong. The sentiment lags behind the insight, but it follows it, even though at some distance. Not only is it true that obviously injurious actions are morally condemned, but supposedly injurious actions are likewise condemned. It is thus patent that real or presumed relation to social welfare is a constituent element in morality. It should be remarked here that nothing has been said of the size of the community with whose welfare morality is bound up. In primitive communities moral obligation has no reference to anything outside of the family, the clan, or the tribe. Even at the present day many a man who would not think of swindling a neighbor may have no scruples when it comes to taking advantage of a foreigner, especially if the foreigner be of a nationality utterly alien to his own. But the community within which moral relations are recognized need not be in any sense one of blood relationship. It may be one of trade or calling, or it may be some quite artificial fraternity. All this goes to show that actual morality is not catholic and cosmopolitan, but is apt to be cliquish and clannish, and the size of the community involved is determined by various causes. But these facts do not make against the statement that moral consciousness, wherever found, is the consciousness of social import, or of an ideal self who takes delight in and works for the welfare of some fellow beings organized together in some way.

We have as yet left out of account what probably many would regard as the most distinctive feature of morality—the consciousness of *obligation*. Thus, it is alleged, however erratic from our point of view modes of conduct approved in foreign lands and in past ages may be, some definite course of conduct has always been regarded as binding. The fact of the obligation of some act or another, it is asserted, is, and has always been, recognized by every human being. There is the *form* of imperativeness, so the contention runs, in all human consciousness; this constitutes the framework of morality. The content, the matter, of morality varies indefinitely; the form is immutable. Some such thought as this controlled the mind of Socrates in his attempt to disprove the doctrine of relativity (q.v.), as applied by the Sophists (q.v.) to the ethical life. Plato hypostatized this immutable essence of morality into the eternal supreme "form of the good," the authoritative pontiff, as it were, within a hierarchy of ideal essences. Aristotle, doing justice to another type of moral experience, found morality to consist in certain obligations imposed by the desire to secure certain ends. Christian theology, following St. Paul, construes it as God's law of righteousness—"that which may be known of God" and "is manifest even in the Gentiles, for God manifested it unto them" (Rom. i). "For when the Gentiles, which have not the law, do by nature the things contained in the law, these having not the law are a law unto themselves; which shew the work of the law written in their hearts, their conscience also bearing witness, and their thoughts the meanwhile accusing or else excusing one another" (Rom. ii. 14, 15). Ethical intuitionism (q.v.) takes its cue from traditional theology, and finds a "faculty" of conscience in every man; a faculty which may become atrophied in those who stiff-neckedly refuse to give it play, but which is an always present element in the original equipment of faculties possessed by every man. Ethical rationalists (see RATIONALISM), of whom Kant is the great protagonist, ascribe to pure reason an invariable mandatory activity, which operates in every rational being to the production of a recognized obligation to do certain things and to leave certain things undone, just because this doing and this leaving undone is pure reasonableness. In Kant this demand of pure reason is formulated in the principle, "Act only on that maxim whereby thou canst at the same time will that it should become a universal law." This he calls the "one categorical imperative." This "law contains no conditions restricting it," it "is objectively necessary in itself without reference to any purpose." It has its seat and origin completely a priori (q.v.) in the reason, and that, moreover, in the commonest reason just as truly as in that which is in the highest degree speculative; "it is just the purity of" its "origin that makes" it "worthy to serve as our supreme practical principle." "There is no genuine supreme principle of morality but" this which rests "simply on pure reason, independent of all experience." Hedonism (q.v.) roots the universal, unvarying form of morality in the desire of every sentient being to secure pleasure. In what is called the psychological form of hedonism the view is held that "on the occasion of every act he exercises, every human being is led to pursue that line of conduct which, according to his view of the case, taken by him at the moment, will be in the highest degree contributory to his own greatest happiness." (Bentham.) In the ethical form of hedonism it is conceded that "men often, from infirmity of character, make their election for the nearer good, though they know it to be the less valuable; and this no less when the choice is between two bodily pleasures than when it is between bodily and mental. But while men thus do choose the less valuable pleasure, "it may be questioned whether any one who has remained equally susceptible to both classes of pleasure ever knowingly and calmly preferred the lower." Happiness is "the rational purpose of human life and action." (J. S. Mill.) The happiness which reason prescribes as the proper end of life may be conceived as one's own happiness (egoistic ethical hedonism), or it may be the happiness of all sentient creatures (universalistic ethical hedonism), or it may be something intermediate. But however narrowly or broadly conceived, reason is said to demand an effort to secure it and thus to impose an obligation. Perfectionists claim that what is demanded is not happiness, but the full, harmonious development of one's nature and of the nature of one's fellows, until we all attain unto the stature of the perfect man. Certain evolutionists consider the supreme end which imposes obligation to consist in improvement of "the social tissue." (Leslie Stephen.) In all these views it will be seen there is an insistence upon the fact that obligatoriness is an essential mark of morality. Though they differ widely as to the source of obligation, they all agree that coextensive with morality is the phenomenon of obligation.

On the other hand, we find some writers who maintain that obligation is only an accident of morality. Herbert Spencer, in his *Data of Ethics*, comes to the "conclusion, which will be to most very startling, that the sense of duty or moral obligation is transitory and will diminish as fast as moralization increases." "With complete adaptation to the social state, that element in the moral consciousness which is expressed by the word 'obligation' will disappear. The higher actions, required for the harmonious carrying on of life, will be as much matters of course as are these lower actions which the simple desires prompt. In their proper times and places and proportions the moral sentiments will guide men just as spontaneously and adequately as now do the sensations." Among the poets this view is by no means rare.

These two opposing interpretations of morality—the one that regards the consciousness of obligation as indispensable to morality, and the one that regards it as a transitory feature which will be outlived—are each in part true and in part false. The facts warrant us in saying that it is not necessary to the morality of an act that the agent should regard it as obligatory. Many actions which, except upon some preconceived theory, no one would hesitate to pronounce moral, are spontaneous or habitual. A cup of cold water, even when not given "in the name of a disciple," or of the giver's or the recipient's "pleasure," or of "the greatest happiness of the greatest number," or of "the social tissue," or of somebody's "perfection," or of "the moral sense," or of "a universal law of Nature," may yet change hands in an unquestionably moral act. What is required to make the gift moral is that it should be made by one who is *capable* of the consciousness of obligation, and that it should not be regarded by him as a contravention of moral obligation. Not necessarily the presence of the consciousness of moral obligation in each moral act, nor even the absence of the consciousness of disloyalty to a moral obligation, but the susceptibility of the agent to a feeling of obligation, is a universal feature of moral conduct. While susceptibility to obligation marks the moral agent as distinguished from the *non*moral doer of acts, a moral act as distinguished from an *immoral* act may be performed against a felt obligation. The uneasy consciousness of disloyalty to a traditionally recognized moral obligation is compatible with morality, provided the agent has come to recognize an obligation superior to the traditional; for his habitual reverence for the old law and the knowledge that he is drawing on himself the opprobrium of its adherents may fill him with vague misgivings at the very time when his conduct is prompted by fealty to the new order. He acts against the *feeling*, while acting in harmony with the *knowledge*, of moral obligation. Such action, instead of being immoral, or even nonmoral, is a supreme instance of moral heroism. But when the path of duty has been worn smooth by habit, the wayfarer thereon is none the less moral because for the most part he forgets the manner of path he is treading. In the soldier who has been through severe discipline habituated to obedience, the sense of coerciveness has disappeared. The soldier may no longer be explicitly conscious that some other person exacts of him a certain mode of behavior. In general, he may no longer exact this of himself. It has become his nature to do this, and that is all there is to it. But often, again, that is not all. There come times when his nature does not prompt him without hesitation. Then the question arises, "What ought I to do?" This need not mean, "What must I do to escape the guardhouse?" There may no longer be a consciousness of subordination to some external authority, in the sense of some person or some organization that actually demands compliance with certain rules. And yet there is not the sense of license to do anything one may like. Something still *ought* to be done, and something *ought not* to be done. If, however, habit should have altogether become blind second nature, if the agent should have outlived the ability to think in terms of obligation, his action would have lost that one distinguishing mark which differentiates morality from what appears to be the nonbenevolent coöperative beneficence of ants. If morality is to be a term having any specific meaning, it must be saved from application to a condition of affairs in which an idea of obligation is never present any more than are "the evils of starvation at a time when a healthy appetite is being satisfied by a meal." (Spencer.) Our conclusion, therefore, is that acts not recognized as obligatory may be moral if performed by beings capable, on due occasion, of recognizing them as obligatory.

But what is the consciousness of obligation? In how many forms does the consciousness of obligation appear? What gives rise to these various forms? How does moral obligation differ from other obligations? All these questions demand answer in a systematic ethical discussion.

Let us answer the first question by saying that no single definition can be given of obligation. Rather is it true that there are at least two quite different types of the consciousness of obligation, each of which must be described in its own way. Following Kant, we may call these two types the categorical and the hypothetical. In the latter case a person is conscious that he ought to do a thing if he wants to secure a certain end; in the other he judges that he ought to do a thing, without being able to assign any end, as the necessary means of obtaining which the action is obligatory.

Taking up first the consciousness of conditional obligation, which is called the hypothetical imperative, we find that the experience in which it appears can be described as follows: "I want a certain result; and a certain act is indispensable if I am to secure that result. Therefore in so far as I am motived by the desire and directed by my judgment I must in consistency perform the act." The fact that when a certain desire and a certain judgment respecting the means of satisfying this desire are present in experience a certain act is felt to be required for consistency's sake, is the fact of hypothetical or teleological obligation. When I experience that requirement in my consciousness, I say that I ought to do that act. Man as desiring and as not securing a certain object is man at odds with his environment. Man as desiring and yet as not doing what he knows to be necessary to secure a certain object is man at odds with himself. He is inconsistent. His action does not comport with his desire, and because he knows that there is this incompatibility his action does not comport with his knowledge. It is unintelligent and irrational. The irrationality of the act is concrete and not abstract. It consists in incongruousness with a known definite situation. Vary the situation, and the demand of reason or the obligation varies likewise. The obligation is contingent, because reason itself alone cannot create it. But given a desire and a knowledge of some means to gratify it, there always is in a thinking being, just so far as he reflects, the consciousness of the incompatibility between the existence of the desire and a failure to perform the act known to be a necessary means of satisfying the desire. In case there are two desires, and the necessary measures to be taken to appease them cannot both be taken, there arises a conflict of obligation. This conflict is adjusted only when one desire has become a preference. Then its corresponding obligation overrides the other. "Practical reason" is just the acquiescence in the ascendancy of this desire, and the decision in favor of that conduct which this desire imposes. Often the part played by "reason" in the conflict of obligations is different, for it often happens that the relative strength of a desire is modified by knowledge of the results that follow its gratification. The gaining of this knowledge introduces a new situation, and the desiderative attitude taken towards the foreseen consequences modifies the previous desire, strengthening, diminishing, or counteracting it as the case may be. The former object may still appeal, but its appeal is overborne. In such a case we are said to do what we reasonably ought to do. The teleological obligation is, then, the control of present conduct by an idea of a future good as opposed to the solicitation of some more immediate good.

But there are obligations which are categorical. Often we do not say to ourselves, "Do this because you want that," but merely, "Do this." There arises in consciousness a command saying "Thou shalt" or "Thou shalt not," and often this commandment is recognized as having rightful authority. How does this command arise?

To some extent, without question, it arises by reason of an economical tendency to abbreviation, characteristic of all mental processes. We begin by saying to ourselves, "Do this because you want that," and we end by saying shortly, "Do this." And not only may we fail to give a reason, but, as often happens in other reasoned processes, we may come to forget that we have had a reason. Then the command appears as self-evidently reasonable. That this process actually takes place cannot be denied. But it is perhaps not the strongest influence at work in producing categorical imperatives. For this we must perhaps look to another principle well recognized in psychology, though not often applied to explain the consciousness of unconditional obligation.

The principle in its simplest form appears in hypnotism (q.v.). It is well known that a hypnotic subject feels constrained to follow almost all the commands of his hypnotizer. Ordinarily he unhesitatingly obeys, and does not question the latter's right to issue orders. He may begin to do something else, but feels a restraining force. If he stops short of full performance, he will say to himself, as one of Ochorowicz's patients is recorded to have said, "I have something yet to do." (Ochorowicz, *Mental Suggestion*, Eng. trans., p. 63, New York, 1891.) This susceptibility to the word of command is not peculiar to hypnosis. We all know how strong is often the impulsion to do what a man with "strong personality" orders us to do. We say he has "personal magnetism" and can make everybody do what he wants. We are also coming to say sometimes that he hypnotizes us.

Now, if we reflect that there are certain commands that have been issued to us from our infancy up, by those who in our childhood imposed themselves upon our will; if we remember that every time we were caught disobeying them we were made to feel the inexorable resolution in all our friends to hold us up to the law laid down; if we consider how our countertendencies were sternly checked while the "suggestive" force of the command was allowed free swing—can we wonder that, in presence of such a constant, uninterrupted imposition of commands upon us, even the most stubborn of us have come to feel, when we fail to live up to those laws, as the hypnotic subject above alluded to felt—that we "have something yet to do"? Gradually the very thought of acts contrary to these commands calls up in our consciousness the momentous words "Thou shalt not," and the long habit of acknowledging their authority accords them, when thus revived, the same recognition of rightful claim over us as they had when enforced by parent and teacher and preacher and exacting neighbor. The outer law of man becomes now the inner law of "conscience," and under the influence of current conceptions may be referred to some *daimon*, as by Socrates, or to some ministering angel, or to God's voice in man's soul. All these explanations are but attempts to explain the fact, easily explicable by psychological laws, that "when Duty whispers low 'Thou must,'" Duty is only a reverberating echo of old commands indefatigably inculcated on us by all the personal agencies that have taken part in our moral education. Reason may have no part to play in this process. The most absurd commands may be imposed and be loyally accepted as unconditionally binding, as the history of morals shows.

But a time comes in the history of some individuals when the spell of the word of command is broken. They begin to ask, "Why must I be moral?" They challenge the authority of arbitrary demands and seek a reason for the moral law. This is a critical moment, big with possibilities of progress or downfall. In default of wide experience a man may at such a juncture devote himself to what he calls pleasure seeking.

If, however, it can be shown him that the law did not enter that offense might abound, but, in large measure, that invaluable human ends might be realized, the desire he may naturally have for these ends may turn into conditional, teleological imperatives the obligations heretofore blindly accepted but now questioned. Open-eyed submission may take the place of the blind hypnotic control, now spurned; and "in the confidence of reason" he may come to yield himself a loyal subject to the law as a law of liberty. Categorical morality, the morality of code, gives place to reasonable morality, a moral of insight into values. Law as a rule-of-thumb gives place to law as an intelligent principle of conduct.

When the change takes place, it must be expected that the contents of the law will not remain wholly unchanged. Of the many exactions made in the name of morality, it would be strange if some are not found useless or even mischievous. In the nature of the case this discovery can never in its completeness be the work of any one man or age. The problem is too complex, and the complexity is increased by a constant shifting of values. (Nietzsche's *Umwertung.*) A teleological morality is that system of conduct that most completely meets human needs and realizes human aspirations. As needs and aspirations vary, so teleological morality must vary. Thus, the partial solution of the moral problem of one age means a change in the terms of the problem for the next; for every partial solution creates a new situation giving a new outlook, and the exact attitude of new beings to a new situation with a new outlook can never be foretold by human prophecy. This, however, is no reason for despair; for only those who look forward with ecstasy to stagnation could wish to have the problem of morality definitely solved with one flash of insight. But while the problem is never solved definitely, it is progressively solved. Modifying Hegel's famous dictum, we may say, *Die Sittengeschichte ist das Sittengericht* (the history of morals is the judgment of morals). But whatever may be the form which the solution takes at any particular time, this form is now imposed categorically upon the young and immature, so that what is teleologically obligatory for the man of insight becomes categorically obligatory for the unsophisticated.

We thus see that moral obligation can be described in terms of neither the categorical form alone nor of the hypothetical form alone, but these two forms of obligation represent different stages of morality. Teleological ethics and duty ethics each leaves, therefore, out of account a large part of the moral phenomena. The rival schools ought to join hands in recognizing that each is true to certain facts of the moral life, while neglecting others upon which its rival has concentrated its attention. But it is not enough to know that morality tends to become teleological, as men become more intelligent. Men have desired to know what end it comes to recognize as imposing the obligation to be moral. Is there any single object the desire for which is supreme in all human beings who know what they are about?

Hedonism (q.v.) attempts to furnish an answer to the question. It maintains that we ought to be moral, i.e., to do the acts and have the dispositions ordinarily described as moral, because we desire to obtain the greatest amount of pleasure possible or the least possible amount of pain, whether the pleasure and pain be the agent's or some one else's, and because morality is the course which we must pursue in order to obtain this end, which for brevity we shall call the hedonic end. For the hedonist moral actions are obligatory because the plan of human lives, as involving the pursuit of a maximum of pleasure or a minimum of pain, imposes this obligation as a means to the realization of the hedonic plan. But questions arise now as to the hedonic plan on which morality as an obligation is said to rest. Is this plan an actual plan in all rational human lives? If not, are those who do not adopt it exempt from morality? If they are not exempt, is this because they ought to adopt the hedonic plan? If they ought to adopt it, what imposes *this* obligation? On these points hedonists differ, and it cannot be said that any answers given are satisfactory. Bentham and others maintain that the hedonic end is the actual end of every human being, and for this reason it *ought* so to be. This doctrine is called psychological hedonism. But Sidgwick (q.v.), another hedonist, says with point that if an end is an actual end of conduct in every case, there is no propriety in saying that it ought to be; and that the hedonic plan is not the actual plan of all, or even of most, human lives. Most persons pursue such ends as the acquisition of wealth, of knowledge, of reputation; they do not seek pleasure pure and simple. Nor is it true that they seek wealth, knowledge, and reputation merely because they regard these as means to future pleasure, any more than the normal man eats merely or predominantly for the sake of the pleasure that comes from the stimulation of his palate by food or from a full stomach. The ordinary man eats his three meals a day, for the most part, either because he is hungry or because he has a three-meal habit; it is true that the expectation of pleasure from his meal often has a part to play in the matter; but careful introspection will perhaps show that it is not often a very influential factor in determining his eating.

Most of the things we do are not done, then, for the sake of the pleasure we expect to get from the doing. If, now, it is the hedonic plan that imposes moral obligation, what about the large number of persons to whom the hedonic end is not a supreme end? Are they exempt from moral obligation? It would be a rash hedonist who should say Yes, in face of the fact that these very persons who do not pursue a hedonic end yet admit moral obligation. Many hedonists, therefore, prefer to say that the pursuit of pleasure is not always, but always ought to be, the supreme end of life. This doctrine is called ethical hedonism. But if it ought to be, what imposes the obligation? The answer given by ethical hedonists is that the obligation is self-evident: every reasonable man will upon reflection recognize that pleasure is the only end worth striving for. But unfortunately such a statement is not true; too many intelligent persons who have understood clearly the terms of the proposition have denied it point-blank; and a proposition denied by an expert may indeed be true, but it is not *self*-evident. How, then, prove that every one ought to pursue pleasure? What plan of life is there that can impose such an obligation? To this question several answers have been given. Just one answer need be cited here. Some say that *reason* requires that one should pursue pleasure. Thus, Sidgwick in the last analysis makes reason dictate to rational beings the pursuit "of the greatest amount of happiness as a whole." This doctrine is thus at the bottom very much like Kant's (q.v.) categorical imperative; appealing to reason as the court of last resort, it differs from Kant's only in its view of *what* reason demands. The objection to this view is, as we have observed, that many rational creatures do not recognize the rationality of the end which Sidgwick thinks prescribed by "the dictates of reason." And there has as yet been no method of argument devised to convince these dissenters that they are wrong. Many persons seem to think that the glory of God reasonably overrides every consideration for "the greatest amount of happiness as a whole," while at least some persons think that they are reasonable in pursuing their own private happiness as the supreme end. And yet Sidgwick admits that if anything is reasonable it is objectively valid, and those who cannot recognize its validity are wrong and can be proved to be wrong.

Kant maintained that the supreme end of morality is the cultivation of the good will, and for Kant the good will is the will directed towards the realization of a kingdom of ends in which each member is treated as an end in himself and not as a means to some other end. Reason demands acting on the maxim that the agent can wish to have become a universal principle for *all* moral agents. Such maxims can, he thinks, be discovered by finding out whether a rule if carried out universally will be capable of indefinite continuance. The rule of permitting suicide, e.g., is not moral because, if universalized, it would result in race annihilation, which in its turn would put a stop to the continuance of suicide. Hence suicide as a moral principle is self-stultifying, is morally suicidal! But Kant was a bachelor, and no doubt thought his celibacy moral. If, however, he had applied his method to the question of the morality of celibacy, he would have discovered that celibacy would by this reasoning be as immoral as suicide, leading, when universalized, to a condition in which celibacy would be impossible. His principle is artificial and fantastic.

The fact seems to be that no amount of *argument* will bring about a consensus as to the reasonable chief end or *summum bonum* of all men, because the answer depends upon the nature of the man who gives it. The fact of the dependence of aim on desire is evidenced in the changes that take place year by year, sometimes week by week, in the growing boy. His desires change, and with the change there is a corresponding change in his chief end. Values are thus determined by the relative strength and persistence of the desires. There could be a common chief end for all men only if there were a common chief desire in all men. Historically there has been no such thing, but there has been an approximation to a chief desire common to all the members of some single community, and it is to such phenomena that we must look for the source of moral obligation. However human communities come to be, there is every reason to believe that a common morality came gradually into existence only within an already existent community, even though that community were only a small family. Within such a community, with common associations and common attachments, the welfare of the community can well be the object of common desire, and in small and seemingly primitive communities which we have an opportunity to know from direct observation, the welfare of the community is usually the object of the most persistent desires. This can perhaps be in part, i.e., negatively, accounted for by natural selection. Those communities whose members do not subordinate all other objects to the welfare of society cannot hold together. But this is only a partial explanation. Other factors make positively for the same result. Mutual affection is one of these factors; imitativeness is another. We all know well how the child gets his enthusiasms from his elders and from his mates. Seeing what they value above all things, he comes to set the same supreme value upon this same thing. And this tendency is fostered by the elders in their training of the young. The family, the clan, the tribe, is glorified in song and story, and no pains are spared to engender in the young the spirit of loyalty. In this way every normal child within the community comes to have a predominant desire shared with all his fellows. Many evolutionist writers seek to explain such social traits as mutual affection, imitativeness, loyalty, as themselves results of natural selection. The tenability of this explanation is open to question, but into the problems of the limits to which explanation of sociological phenomena by natural selection can safely be carried we cannot go here. At any rate, among human beings there is normally a desire for social welfare, and the realization of this desire involves obligations. Experience teaches what actions are necessary to render the realization possible. These actions become obligatory with the acceptance of the end, and because the end is not questioned the obligations it imposes come to be regarded as absolutely unconditioned.

But experience is not the only agency at work in suggesting means for the accomplishment of the common social end. Superstition plays its part. Many means are supposed to be necessary which are really not necessary. How this comes to be is intelligible only in the concrete case. Dreams, hallucinations, accidents of all sorts, are regarded as having value in suggesting proper means to strengthen the community. Thus experience showed that cowardice was fatal to tribal welfare; but it was also thought that "meet adoration to the household gods" was as necessary as bravery. Whatever in any way came to be regarded as a necessary means to secure the public welfare came to be unconditionally demanded; and thus, as we have seen, arose categorical imperatives. But their rationally binding character on the individual depended entirely upon his acceptance of the general scale of values current in his community. In primitive times this acceptance must have been all but inevitable. Liberty of private opinion is a modern luxury, and when private opinion is not tolerated the individual either accepts the general estimate or is killed or banished.

It should be noticed that in the above explanation of the ethical solidarity of a primitive community, it is not implied that tribal morals are forced upon every member of the tribe against his will. In the large number of cases the obligations imposed are cheerfully accepted. There is no thought of revolt. The individual may even feel that his observance of the tribal regulations is of his own undetermined will. But freedom of choice is not incompatible with an explanation of the causes of choice. The question is not what views the individual has of the origin of his ethical unanimity with his fellows. His views on the subject, as well as his views about the origin of his tribe from some totem animal, may be absolutely false. The question is, what view a careful scientific investigation of the facts, sociological, anthropological, and psychological, renders probable or satisfactory as a working hypothesis; and all that is claimed for the above explanation is that it seems to do justice to all the facts, and is the only explanation as yet given that does this justice.

The explanation thus given of the moral unanimity within a tribe explains also such limited measure of moral unanimity as we actually find between tribes. When actual experience of social injury resulting from some course of action is the chief cause of the social condemnation of such act, it may very well be that communities widely separated have the same experience. Such consensus of moral judgment as is found actually to exist among different communities is thus largely to be accounted for by similar experiences under similar circumstances. Such consentient judgments as are not thus accounted for may perhaps be explained by common tradition from some common source, or, in some cases, by accidental coincidences. Such differences as are found to exist may be accounted for by differences of circumstances, of superstition, intelligence, or by other considerations. Thus, scarcity of food in communities where men are the food getters may make polyandry socially advantageous, while in other communities, where different conditions prevail, polygyny may not be recognized as prejudicial to the interests of the community. Differences in moral views due to differences in superstition and in intelligence are too numerous and too well recognized to need more than passing remark.

With the growth of freedom of the individual to think for himself, there inevitably comes about a change in the moral conditions. Individual freedom is often gained at the expense of the integrity of the tribe, or of the state into which the tribe has grown or merged. At such times, with the removal of the cause that makes for unanimity of ethical judgment, morality takes on a personal rather than a social character. The morally right is no longer so much what is socially advantageous as what is to the advantage of the individual agent. This desocialization of morality is a marked feature of the later ethics of the Greek decadence, and to a large extent of the ethics of the revolutionary eighteenth century. And this change of the moral centre of gravity from the community to the individual continues until a new social integration takes place. During such a period of transition from one form of social morality to another, many superstitions disappear; perhaps some new ones take their place. Some are modified instead of totally disappearing. This change in superstition profoundly modifies the character of morality, which tends to dissociate itself from superstition and to depend more largely upon intelligence, but not necessarily upon the intelligence of the individual moral agent. His insight, if it is superior to that of his fellows, tends somewhat to modify current moral views; but normally this change is slow. Not only insight, but emotion, plays the part of cause in such change. A man of strong affections may succeed in arousing the feelings and modifying the desires of his fellows, and this affectional change may ultimately result in marked alteration of social morality. Of course it must not be thought that the action of intelligence and of emotion can ever be completely separated. All that can be said is that either intelligence or emotion may vary largely without equal variation in the other, and this noncoincidence of variation makes it possible to distinguish with some precision changes in morality that are mainly due to change in knowledge from changes in morality that are largely due to change in feeling. Thus the ethics of modern warfare differs from that of earlier times more, perhaps, by reason of a growing cosmopolitan sympathy than by reason of insight into the uselessness, even the harmfulness, of wanton outrage committed against an enemy. But in this case growth of insight has also undoubtedly played a part. On the other hand, such change as has taken place, at least in America, in the moral attitude towards the marriage of a widower with his deceased wife's sister, is due rather to growing knowledge of the harmlessness of such a union than to any increase of sympathy or to other emotions, although even here emotion may have something to do with the change.

We are now perhaps in a position to define morality. The definition is long and cumbersome; but this is due to the fact that the thing defined is, as we have seen, very complex in character. The definition will run somewhat as follows: Moral conduct is the voluntary action of a self-conscious person, in so far as that action is amenable to a standard of obligation imposed on him by social influences or by a comprehensive plan of life that draws its materials from society. In moral conduct the plan of life is always first adopted by the agent from the community in which he is reared, whether family, clan, tribe, or religious organization; but it may afterward be more or less modified by his intelligence, emotions, and personal experience. Let it be remarked, by the way, that, apart from the use of the word "moral" as an epithet applicable to all phenomena thus defined, it is also frequently used to denote only those actions that *conform* to the obligation mentioned in the definition. In the former sense the antonym of "moral" is "nonmoral"; in the latter it is "immoral."

We are now able to understand how the conduct of moral idiots, i.e., beings without any community of obligation with other men, stands related to morality. These persons seem never to have adopted from their social environment a general plan of life. This failure is largely due to defect of instincts. They never seem to care for the valuation set by society upon different human ends. They seem to choose from the outset selfish ends. They seem, in a word, to be nonmoral rather than moral. And this exemption from morality is not always due to lack of intelligence; it may be due to abnormality in emotional endowment; and in many cases there seems to be no remedy at hand. But there are other persons to whom the above description does not apply, and yet who, on superficial examination, appear to be moral imbeciles. These persons have adopted a general plan of life from their social environment. But the environment may be exceptional; i.e., it may widely diverge from the general character of other social environments of the same time and in the same region. These moral agents are insensible to the ordinary moral ideas of the time, because these ideas are incompatible with ideas they have long held. Perhaps the insensibility has become chronic; perhaps it is still remediable. Only experiment can determine. These persons are not moral idiots, i.e., not nonmoral. They are moral unfortunates; they may not even be seriously immoral in the sense of coming far short of meeting such moral obligations as they have come to recognize. Still other persons have begun life with the normal ideals, but for one reason or another they have not lived up to these ideals, and have gone so far as to give up the ideals entirely. All these differences must be taken into consideration when one is asking whether a particular departure from ordinarily recognized morality means immorality or nonmorality. It is immorality only when the moral obligation, practically ignored, is still recognized as binding.

But this leads to other questions. Of two different moral standards, can one be said to be more moral than the other? Is there a standard for testing the relative excellence of actual moral standards? Is the actually existent morality subject to evaluation by comparison with a morality which ought to be? If so, what is this standard? How is it ascertained? What imposes it as a standard upon actual morality? These questions have often been thought to be absolutely unanswerable by any science of ethics, for it has been said that science describes, but does not prescribe; that a science of ethics, in the sense of a systematic presentation of actual moral judgments, can indeed be constructed, but not a science which shall criticize actual morality and suggest improvements. Such a statement as to the limitations of science is inadequate. It is perfectly true that no science directly prescribes. The science of geometry does not prescribe surveying, nor does the science of electricity prescribe electric lighting. What a science can do is to describe the conditions which must be met before a given aim can be attained; and among several means to the attainment of an end, it can point out that which involves the least effort or that which is the best under given circumstances. Every so-called practical science is a more or less systematic knowledge of the conditions which must be met before a certain result can be obtained; but it cannot be accurately said to prescribe the result. The result is prescribed by some need and the means to its attainment is described by the science. Now, ethics is a practical science. It makes no absolute prescriptions. All it does is to study the facts of the moral life, and as a result it may be more or less able to describe the conditions that must be fulfilled before any accepted end of the moral life can be realized. This study does reveal many imperfections in actual morality, but these imperfections which we now have to mend are imperfections of means and not of ultimate end. This discussion will enable us to answer the questions placed at the beginning of the paragraph. Of two moral standards, in the sense of moral rules prescribed for the attainment of a certain accepted moral end, one may be more moral than another, in the sense of being better adapted to attain the moral end. The standard by which two such differing moral standards may be tested is that of conduciveness to the moral end. The existing morality, in so far as it consists of such rules, may easily be defective, and a more adequate knowledge of all the pertinent facts may result in the discovery of a morality that ought to replace the actual morality. This discovery is the business of science; the acceptance of the obligation to forsake actually observed rules and to adopt the newly discovered rules of action is the work of the moral agent as a person with a supreme plan reasonably pursued. Thus, it appears that while ethics is concerned with the morality that is, it may also discover conditions formerly unknown; and this discovery may react on the morality that is, making it more like what it ought to be; i.e., it may make moral action more commensurate with the moral end.

Scientific ethics might conceivably do even more. Supposing for the present that actual moralities have had no single ultimate end consciously arrived at, but different ends set up in different communities and at different times, ethics might also discover how it came about that there was thus a multiplicity of ends, and it might even discover that there was a way of harmonizing these various ends. It might be able to describe an end which, if realized, would include the realization of all, or of the larger number, of these historical ends. But here, again, a science could not as a science prescribe this inclusive end. Unless the end, as inclusive, appealed to men, ethics could not force it on them. It would occupy a position similar to the science of telegraphy. When it was discovered that it was possible to send a message over long distances with great rapidity, this bit of scientific knowledge did not prescribe to men the adoption of the means of transmission. It was only human needs that imposed the obligation to adopt telegraphy. This inability of science to impose new ends constitutes part of the tragedy of scientific inventions. Many a man has devoted his life to making possible the attainment of a new end, only to find when his labors were done that the end was not desired by mankind at large.

Now, as a matter of fact, it can be said that ethics has discovered a multiplicity of ends among men. As we have seen, sometimes it is social welfare, sometimes it is individual welfare, that men make their supreme end. Again, both social and individual welfare are very differently conceived in different times and places. Sometimes social welfare is thought to consist in military strength; sometimes in economic conditions; sometimes in artistic productiveness, and so forth. So also individual welfare is sometimes thought to consist in the possession of abundance of means of sensual enjoyment, or in physical prowess, or in intellectual power, or in social prestige, or in religious zeal, or what not. With regard to all these various ends, ethics can discover or attempt to discover, with the help of other sciences, whether when attained they have given permanent satisfaction; whether rather the attainment of many of these ends has not, as a rule, brought in its train misery which could have been avoided had the ends not been sought; whether such disappointment was due to accidental circumstances, or whether, human nature and human environment being what they are, such disappointment was inevitable; whether, if the latter alternative be true, any other end could have been pursued with reasonable chances of better success. But suppose all these questions answered and an end discovered which promises, when attained, to give satisfaction.

Even then it would be only the desire of men for such an end that could impose upon them the obligation to adopt the course of action necessary to attain it. Again, suppose such an end were a social end, and could not be realized within the lifetime of any now living, but could be attained in, say, 500 years. Whether the pursuit of that end would be undertaken or not would depend upon the relative strength of the desire for that future consummation and the desire for other objects that would necessarily be sacrificed in order to work for that consummation.

There is, however, another question that must be answered here: Is there no difference between what is actually desired and what is really desirable? Take the last case supposed. Granting that mankind at large did, when such an end was presented to it, reject it as too remote and too quixotically altruistic, and did set about to realize some other end, could it not be said that, in spite of the fact that the end is not desired, it is desirable? Or shall we have to say, with J. S. Mill, that "the sole evidence it is possible to produce that anything is desirable is that people actually desire it"? In answer it must be said that desired and desirable are different conceptions; that people often actually do desire what is undesirable; so that Mill's statement cannot be accepted as it stands. But there is a profound truth which the statement perhaps attempts, but fails to express. The statement must be amended. Nothing is desirable that is not desired, *or would not be desired if adequately known*. Thus, I may desire a certain fruit I see for the first time. Its color is tempting, its whole appearance makes a strong appeal to me to pluck it and eat it. But in spite of this the fruit may not be desirable. It may be deadly, or it may be extremely sour or astringent; or it may have a nauseating smell, which as yet I have not perceived. It would be desirable if I knew all about it and still desired it. It is a common experience that things eagerly desired are found afterward to be undesirable, and are then judged to have been undesirable all the time we were longing and striving for them. Thus, the measure of desirability is not the strength of the actual desire which persons have, but the desire they *would* have if they only knew the real bearing of these desires upon other things they are interested in.

Among the things that should be adequately known are the character and tendency of our future desires. A blind man may have no desire for fine paintings in his room. But if he knew that within a few years his blindness would be cured, and that then he would crave beautiful objects of sight, the knowledge would tend to make him now desire to have the pictures. Now, apply this answer to the supposed case that called forth the question. The welfare of society 500 years hence would have no value to men who were not genuinely unselfish, i.e., who desired only their own pleasures. But men do actually desire other things than pleasure, even when they know that these things cannot possibly bring them pleasure in the future. Many a disbeliever in immortality has earnestly desired and worked for some end which he knew could not be accomplished until long after his death. It is true that he would not have so worked for it if he had not at the time taken pleasure in the end; but he did not work for the sake of a future pleasure to come from a future realization of his plan. If the welfare of humanity 500 years hence, when the idea of that welfare is clearly presented to now living men with all its bearings upon all their desires, did not arouse a desire to realize it, that welfare would not be desirable for *these* men. This difference thus described between the desired and the desirable also holds good between the preferred and the preferable. The preferable for any man is what he would prefer if he actually had all the information that was necessary for an intelligent preference. So also, finally, the supreme end, or *summum bonum*, for any man is that end which is for him preferable to any other. The nature of all his desires in their true interrelation and in their relation to the actual world in which he lives, determines the *summum bonum*, but he may not know what that *summum bonum* is, because he may not understand thoroughly either the world in its relations to the system of his desires, or the interrelation of his desires. In the sense that a science of ethics may, conceivably at least, throw light upon these questions, it may discover the *summum bonum;* but it cannot impose upon any man a *summum bonum* which is irrespective of his actual nature as a being with quite definite desires.

If the question is now asked whether ethicists have as yet come to any agreement as to the nature of the *summum bonum*, the answer must be No. However, the following description of the *summum bonum* is given, because it seems to do justice to all the determining factors of the problem. The *summum bonum* of any moral man is not any one single object. It is rather a progression of objects. The *summum bonum* is a serial system of ends which are, each in its turn, the most desirable ends capable of pursuit. An element in its desirability is that it shall fix favorable conditions for further pursuit of further desirable ends as well as give pleasure in the ends already attained. Again, because the normal man is a social man and thus interested in seeing at least some of his fellows obtain what is desirable for them, there is found among the ends included in the *summum bonum* the welfare of these fellowmen. By welfare is meant the progressive realization of the progressive *summum bonum* of each of these fellowmen. Now, the fact that the *summum bonum* of each normal man includes within itself the welfare of some other men constitutes a community of welfare. The question how many persons shall be included in the community of welfare is determined partly by objective conditions and partly by the actual reach of the benevolent emotions: by objective conditions, because no matter what may be my affectional attitude towards another man, it may be the case that unless he has his welfare he will be an impediment to my obtaining my welfare; by the actual reach of the benevolent emotions, as is proved by history, which shows that as men have become larger-hearted, the community of interests is shared in by a larger number of individuals. It must be borne in mind that the *summum bonum* thus described is not imposed upon any individual by any obligation. Unless an individual is so constituted that he finds such an end the most desirable of all ends, it is not his *summum bonum*. All that has been attempted is to describe in very general terms an end that it is believed will be found to be most desirable by normal human beings. Abnormal human beings, who have no liking for their kind, or who are rabidly monomaniacal, or who in some other essential features vary from the kindly race of men, are not taken into account. Their *summa bona* are radically different, and because this is so there is apparently no possibility of welfare for them consistent with welfare for normal men. They are not included directly in the community of human interests. All that can be demanded for them is so much of welfare as is consistent with the welfare of mankind in general.

But though ethics as a science cannot impose an end on man, man individually and collectively can impose ends upon man to a certain extent. It is a fact, as we have already seen, that what a person shall desire is to a large extent determined by what other persons desire. A community or an individual with a definite conception of a supreme end can do much to influence a child or even an adult to desire that same end; and this makes moral training possible. Moral training and the teaching of ethical science are two quite distinct operations, although they may, and often do, go hand in hand. Moral training consists in an attempt to habituate a person to actions and dispositions such as are desired by the trainer. It is the process of initiating a person into a communion of ends with another person or with a group of persons. Ethical teaching is the process of bringing a person to see and understand the facts of the moral life. The former is an attempt to develop appreciations, the latter to develop insight. An appreciation without insight is blind; insight without appreciation is ineffective.

Moral training, however, is a fact in the moral life, and as such the investigation of it has a place in ethics as a science of the moral life. Ethics studies the facts of moral training and discovers whether the method adopted secures in the most effective way the end desired. It may ascertain, e.g., the fact that an actual particular kind of punishment is evil; that is, that instead of preventing crime it aggravates and multiplies it. Ethics may discover that other methods would avert these evil consequences and produce advantageous results, and it may discover the best means to the securing of these ends. All this is a matter of descriptive science, not in the least directly prescriptive. The beneficial ends are prescribed to men by their desire; the means are discovered by experience and experiment. A study of moral training shows that it is a very complex affair, and into its complexities we cannot here enter. Example and precept, admonition and chastisement, reward and "pious fraud," threats, actual infliction of pain, appeals to nascent desires and aversions, are all employed more or less frequently. All these instruments of moral training have their characteristic effect, and these must be experimentally ascertained. And again, not only moral training, but vengeance, is a phenomenon of the moral life. It aims at the infliction of pain on an offender to appease by his suffering the suffering of his victim or of the sympathizers of his victim. It has its characteristic results. These are studied by ethics. The results of this study may, as a fact do, secure general condemnation of such vengeful punishment; but this, again, is because the outcome of a vengeful policy is undesirable.

But there is a limit to what ethics as a science can do in securing acceptance of a common end. As we have seen, all that science can accomplish in this respect is to set forth different ends, the means to their attainment, and the consequences that would come from their attainment. Now, the fact is that different persons react differently to these proposed ends. Some want one realized, and some want another. Consequences that to some are revolting are desired by others. In such a case no amount of knowledge can decide the issue. We have here a conflict of ultimate ideals, and such a conflict can be decided only as all conflicts between unsympathetic interests are decided, viz., by struggle and the eventual victory of one over the other. In such a struggle argument does not play the decisive rôle. The appeal is to another tribunal, the tribunal of force. The force employed is not necessarily physical, although often it culminates in that. In a stable society the conflict is usually carried on by the use of such instrumentalities as persuasion, praise, and blame. Persuasion as opposed to argument is the process of arousing desires which shall supplant previous desires. Our desiderative natures are not something static, something we inherit and keep without change. Our desires are more or less pliable. We are liable to conversion, i.e., to a change in the whole bent of our longings. A powerful personality can incalculably modify the sentiments of a community. Thus, a struggle between antagonistic ideals is often a test of personal strength between its adherents, and more especially between the leaders. The cause that secures a magnetic leader has won half the battle. In persuasion praise and blame are employed. The desire for the approval of some outstanding personality is a mighty force in securing the adoption of a new ideal. The fear of such a man's blame will bring the vacillating into the fold. Once in, the followers become habituated to the new ideal and inculcate it upon their children. In this way, radiating from some one central person, a new ideal may sweep a nation or a continent. Of course, the social and the economic conditions must be ripe for the exercise of this personal influence, but in the last resort it is the personal influence that wins the battle. The moral ideals connected with the great historical religions secured their footing by such a process. Buddhism, Christianity, and Mohammedanism, as moral ideals, owe their ascendancy in large measure to the magnetism of their founders. Their spread was a personal victory.

But often resort is had to physical force. This is clearly instanced in the great change that took place when the practice of blood feud was replaced by the now current dispensation of justice by the state. In England, when the central government first took the control of criminal law into its hands, public sentiment was against the usurpation. The clan system had been in vogue for countless generations, and what thus had the sanction of immemorial usage was naturally regarded as just and moral. The encroachments of the crown were resented as unwarranted interference, and a struggle was precipitated. It was the physical strength of the crown as compared with the growing weakness of the clan that gave victory to the principle of state control. The will of the physically stronger formed the basis of the newer justice. In the course of time the sentiments of the community became adjusted to the new order of things, ideas of what was right came to be molded upon the practice which thus came to prevail, and what a short time before was fought as an intolerable infringement is now regarded by most people as a self-evidencing right. The might of the state brought about the right of governmental penal control. The course of history is full of instances where victory in war established new moral ideals among the conquered. Even the moral ideals of many of the great religions have used physical force in their propaganda. Mohammedanism and Christianity have spread into many places by the agency of the sword; when established by might, time brought prescription, and subsequent generations accept loyally what their ancestors fought.

It is a great mistake to suppose that morality is a matter of pure intelligence. It is an exceedingly complex interest, and in the making of it all sorts of factors have played their part. For this reason moral history can never be predicted. European moral ideals owe their present existence to numerous battles that once hung in the balance, to economic changes unforeseen, to personal leaders whose advent was unheralded. Might—the might of personality, the might of economic conditions, the might of legions and battalions—has established the ideals which are now current and are regarded by their devotees as the expression of eternal right.

Few would perhaps question that such might has been instrumental in establishing ideals, but a distinction would be urged between the validity and the establishment of an ideal. Validity, it is often argued, is something that has its roots in the ultimate nature of reality, while the establishment of an ideal is a mere matter of history and subject to changing historical conditions. But such a distinction overlooks the fact that an ideal is in its very nature an appeal to inclination, to preferences, to loyalty. And the character of the persons to whom the appeal is made is integral to the constitution of the ideal as ideal. And character is not something that is immutable, but is subject to historical influences, so that the essence of an ideal as ideal is relative to the historical factors that determine character. The validity of an ideal is just its acceptance as an ideal, and its acceptance is its establishment where accepted. The only question, then, as to the validity of an ideal is its generality, i.e., the number of persons whom it engages in its service, and its durability, i.e., the length of time during which it succeeds in securing and keeping the loyalty of adherents.

This view of the relativity of ideals to historical conditions is often objected to on the ground that it is dangerous in practice. It tends, so it is urged, to take away from the moral ideal the stamp of finality, without which it could not pass current. It deprives it of the categorical authoritative character without which it could not maintain itself against personal inclination. The objection would hold good if morality were something independent of human interests, if the moral life were life in accordance with some standard not based on human desires and human satisfaction. The argument, in other words, begs the whole question. Those who hold to the relativity of morality necessarily must regard as humanly moral only what is humanly valuable, and a value does not lose its value for any one because it is recognized as what he with his particular emotional equipment holds dear. The dynamic of values is given to them by the very appeal they make to our interests, and so long as these interests obtain the values remain values. Ideals would lose their grip on men who believe in the relativity of ideals only when these men also lose their interest in these ideals. So long as interests continue, the ideals that are constructed out of them will attract and control. And when interests die out, the allegation of the independence of an ideal will not bring them to life. The vigor of an ideal is fed, not by a theory of its origin, but by the experience of the effects of its operation or by the authority of those who impose it.

The possibility of the evolution of morality out of nonmoral conditions was some years ago seriously contested on metaphysical and theological grounds. The theological grounds do not concern us. The metaphysical grounds of objection are invalid. The strongest argument of the opponents of evolutionistic ethics is based on the necessity of self-consciousness for morality and on the alleged impossibility of the evolution of self-consciousness. The fallacy of this argument has been often pointed out. The "timelessness" of self-consciousness does not consist in the fact that the self has not a place in time as an event, but in the fact that the objects of that self's knowledge are not confined to the sensations of the present moment. The assertion that a consciousness in time cannot know time is an unfounded dogmatic dictum, and yet only on the supposition that this statement is true can it be maintained that consciousness and self-consciousness are in their nature incapable of explanation by evolution. The exact course taken in the evolution of morality from the nonmoral is still an open question; but the truth of the statement that morality is an evolved product stands or falls with the general truth of the evolution of man from the nonmoral animals.

The only other question that can be discussed here is that of free will in its bearing on morality. Can there be moral responsibility if the will is determined, i.e., if the volitions of man are events which find their complete causal explanations in previous events? In the light of what has been said it must be maintained that, unless human volitions were determined, responsibility would be impossible. Ethical responsibility is primarily the liability of a person to answer for his conduct before the bar of public opinion, whether that opinion be expressed in custom, religion, or law. A man commits an act and is held responsible. This means that he is subject to the demand of his fellows to prove that his act is in accord with the generally accepted plan of life, or that his variant plan is the right plan. Given an accepted plan, intelligent experience can determine the relation of an act to the realization of that plan. A reasonable person who adopts that plan may be constantly called upon to justify the means he takes to realize that end. Condemnation of an act in such a case means that it is recognized as not conducive to that end and that it is disliked as having that tendency. Approval means that it is recognized as conducive to that end and is liked as having that tendency. Or again, instead of raising a question of means to an end, there may be a question about the end. We have seen that, though the actual supreme end pursued is not imposed by reason, yet knowledge of the bearing of the attained end upon actual desires may lead to change of ends. Moral responsibility may mean the liability of a person to justify his supreme end, i.e., to show that it is *desirable* as well as desired. Approval or condemnation of the end is a recognition of its desirableness or undesirableness, and the resulting affectional tone. It of course carries with it approval or disapproval of the means leading up to it. In ordinary life the supreme end is unreflectively pursued, and the means to it taken for granted as presented in some moral code. The only function of conscience in such cases is the approval or disapproval of an act as conforming to the moral code. In any case the whole activity of conscience is useless unless the judgments and feelings involved determine future conduct. Not only so, but also the past conduct judged, if conceived as wholly or in part the pure chance product of some blind arbitrary agent called "will," is not a means to any end, and therefore neither approvable nor condemnable as such. Now, free will, either in the sense of a liberty of indifference or a liberty of alternative choice, in so far as it is undetermined, is pure chance, as is conceded by Professor James, one of the most prominent supporters of indeterminism. Responsibility does not therefore presuppose indeterminism of the will, but it does presuppose that the will can be determined either by the knowledge of the conduciveness of a means to an end, or by the knowledge of the adaptedness of an end to satisfy a desire. A person who can by rational means be brought to see the inadequacy of his acts to the supreme moral end, or the inadequacy of his supreme moral end to his whole nature as a being with definite needs, is responsible; i.e., in case his acts or his ends are undesirable, he can be convinced of their undesirability and be led to condemn them. In other words, he has a conscience. When society holds a man responsible, it brings pressure to bear upon him to bring him or to keep him in accord with the socially recognized plan of life. Responsibility is, then, a means employed to maintain an organized society.

But we sometimes speak of a person as holding *himself* responsible. This happens when a person treats himself as subject to self-condemnation and self-approval. The social restraints and requirements are then not regarded as imposed by others, but rather as accepted loyally by himself, and in the light of this fealty freely given he judges his individual acts as self-justified or self-condemned. To hold oneself responsible is thus the attitude of a man who has risen to the level of freedom in social service. See DETERMINISM; FREE WILL; CUSTOM.

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E'THIO'PIA (Gk. *Αἰθιοπία*, *Aithiopia*). The name given by the Greeks to a country south of Egypt variously conceived as including only Nubia (*Æthiopia Ægypti*), or Nubia, Sennar, Kordofan, and Abyssinia, or a region extending indefinitely east and west from the upper Nile, but applied after the fall of Meroë more particularly to Abyssinia. The vagueness of the term is largely due to the significance attached to it by the Greeks, who seem to have derived it from *αἴθειν*, *aithein*, to burn, and *ὤψ*, *ōps*, face, and explained it as the country of sunburnt faces. Some scholars regard *Αἰθίοπες* as an original Greek designation of the negroes. Others prefer to look upon it as an attempt by Greek folk etymology to extract a suitable sense from an unintelligible native name. It has been plausibly suggested by Glaser that this name may have been *Atyubyan*, incense gatherers, from *tayib*, pl. *atyub*, aromatics, and that this was the equivalent of *Habashat*, the Egyptian *Hbst*, the modern *Habesh*, or Abyssinia. In common use the name is given to the West African peoples of Nubia and Abyssinia (Ethiopian). Deniker (*Races of Man*, London, 1900) applies it to the third of his 29 human races, including Bejas and Gallas modified by

Arab blood among the Somalis, Abyssinians, etc., and by negro blood among the Zañdeh and Fulbé. Keane (*Ethnology*, Cambridge, 1896), while relegating the Ethiopians to their proper place in the Hamitic section of the Caucasic division of man, names the generalized negro *Homo Æthiopicus.* At least since the middle of the second millennium B.C. Eretria and the Somali coast were not unknown to the Egyptians. Through the expeditions of Queen Hatshepset (c.1500 B.C.) down the Red Sea to Punt, the lands on both sides of Bab el Mandeb became more familiar than the territory on the upper Nile. Punt was looked upon as the land of the gods; while the products brought from there caused many a marvelous tale to be told of that country. That the people of Punt were not negroes, but belonged to the Mediterranean race, is quite evident from the pictorial representations. From accounts of them the Greeks may have derived their earliest notions of the men who lived in the farthest south. In the Homeric poems (*Odyssey*, i, 23 et seq.; *Iliad*, i, 423, xxiii, 206) the Ethiopians are represented as dwelling at the utmost limits of the earth and enjoying personal intercourse with the gods. This ideal picture is regarded by some scholars, not as an echo of the popular Egyptian conception of Punt or "the divine land," but as a reflection of the admiration felt in priestly circles in Egypt for the theocratic régime introduced by the Ammon priesthood in Napata during the Twenty-second Dynasty (960–774 B.C.). In Hesiod the term seems to be used vaguely of a territory south of Egypt and Libya. Herodotus (iii, 114) describes the Ethiopians as μακρόβιοι, long-lived, and regards their country as extending to the Southern Sea. This apparently implies that he includes Abyssinia, Eretria, and Somaliland. Later Greek writers use the term sometimes as a designation of Nubia, sometimes in a much wider sense. Historically there are three distinct kingdoms known as Ethiopia—those of Napata, Meroë, and Aksum. There is no definite evidence that either of these included at any time all the territory between the southern border of Egypt and Bab el Mandeb. Only the Kingdom of Aksum seems to have claimed the name Ethiopia; in the case of the others it was apparently a Greek and Roman designation solely.

Kingdom of Napata. For a description of that part of the Nile valley which was ruled from Napata, see NUBIA, and for the city itself, see BARKAL and NAPATA. Already in predynastic times a certain civilization seems to have existed in Nubia. Reisner has recently discovered that the culture of Nagada and Abydos (see EGYPT) extended a considerable distance beyond the First Cataract. The Egyptians of the Old Empire had relations with their southern neighbors. From the forests of Nubia (*Knst*) they obtained a large proportion of their timber, and the city of Yeb (Elephantine) derived its name from the ivory which found its way to this place from the interior of Africa. King Unas (c.3290–3260 B.C.) employed warriors belonging to six Nubian tribes in his war upon the Bedouins. The early pictorial representations of Nubian archers do not suggest that they were negroes. A regular conquest of the country south of Syene (see ASSUAN) apparently was not undertaken until the Twelfth Dynasty (c.2522–2323). The most powerful Nubian people at this time was Kash or Kosh, the Hebrew Cush (q.v.). The ethnic relations of this people cannot be determined with certainty. But it is probable that the stock was originally Hamitic, though in course of time it absorbed various Negritic tribes. Kosh is first found on a stele of Sesostris I. Sesostris III established his frontier north of the Second Cataract, and built for its protection two forts at Semneh and Kummeh on opposite sides of the river. Whether the Hyksos kings ever held possession of this territory is doubtful. At any rate, it had to be reorganized by Aahmes (1575–53), the founder of the Eighteenth Dynasty, and his successors. Napata probably had been the capital of the independent kingdom, since it was made the residence of the viceroy, entitled "Prince of Kosh," who governed the new Egyptian province. In the time of Ramses II (1310–1244) there may have been an unsuccessful rebellion. The high priest of Ammon-Rê in Thebes, Herihor, in the beginning of the eleventh century, proclaimed himself "King of Upper and Lower Egypt." This his successors in the pontificate were not able to do, but seem to have recognized the Tanitic Dynasty. But a branch of the family established itself at Napata, probably at the end of that dynasty (c.1000). In the Twenty-second Dynasty (960–774) these kings threatened the border of Egypt. One of them, Pianchi I, who seems to have reigned in Napata after 777, availed himself of the weakness of Egypt at the end of the reign of Uasarken III (c.762–756) to make an invasion of Egypt. He defeated 20 petty rulers and made a treaty with Tefnacht of Sais in 756 B.C. After his death (746) Kashta (c.746–734) and Pianchi II (c.734–715) were apparently not capable of maintaining any control of Egypt. But the grandson of Pianchi I, Shabaka (715–703), united all Egypt with Ethiopia under one crown. Whether this King is identical with So, the ally of Hosea of Israel, is still doubtful. His successor, Shabataka (703–691), was dethroned by Taharka (691–664). In his time Esarhaddon of Assyria invaded Egypt in 673 and again in 670, when Memphis was taken. On a stele found at Zenjirli in northern Syria Esarhaddon's triumph over Taharka is represented. Taharka was driven back into Ethiopia. Tandamane, or Tanuat Ammon (664–663), tried in vain to reconquer Egypt, where, on the decline of the Assyrian power, Psammetichus I (663–610) made himself ruler. During the reign of this Egyptian King, Herodotus states, a large number of dissatisfied soldiers emigrated into Ethiopia. The place where they settled cannot be determined with certainty, though it has been suggested that the island of Meroë may have received many of them, and their number (240,000) has, no doubt, been exaggerated by Herodotus (ii, 30). An invasion of Ethiopia was probably made by Psammetichus II (594–588), referred to in the Greek inscriptions of Abu Simbel. From the native inscriptions which are now being deciphered it may be inferred that Tandamane continued to reign in Napata until 650. Later monarchs were Asperta (c.630–600), Panchirer (600–560), Harsiotf (560–525), and Nastasen (525–500). The stele of Harsiotf shows that this King conquered several provinces south of Meroë and built many temples. Cambyses invaded the country in 524; but the stele of Nastasen tells of his destroying Cambyses' fleet. The capital was moved to Meroë, but Napata continued to be an important religious centre. Many temples have been discovered by recent explorers in the territory of this kingdom. See SUDAN.

Kingdom of Meroë. On the capital of the new kingdom that gradually arose in the south, see MEROË, and for a description of territories that at one time or another formed a part of it, see SENNAR and KORDOFAN. The Achæmenian monarchs received tribute from kings who seem to have made Meroë their capital. Some of these kings seem to have been of the old line. It is possible that Nastasen's successors made conquests in northwestern Abyssinia. While the theocratic constitution described by Greek writers no doubt had developed already in Napata, the subordination of the King to the priesthood seems to point to a new régime, in which the King was a mere tool in the hands of the clergy. While the suzerainty of the Ptolemies seems to have been recognized for religious reasons, King Ergamenes, by putting to death the priests who had demanded that he should abdicate in the time of Ptolemy IV Philopator (221–204), paved the way for independence. Ptolemy V Epiphanes (204–181) was able to resist his attack upon Egypt, but not to prevent his assertion of sovereignty in Ethiopia. Queen Candace seems to have extended her power in the north, and 25 provinces are said to have been tributary to her. But her invasion of Egypt was successfully resisted by Caius Petronius in 24 B.C. Napata, that had been rebuilt, was destroyed by the Romans. Another Queen Candace is mentioned in Acts viii. The name of Candace has been found on a pyramid at Meroë. But gradually Meroë itself fell into ruins. To guard against invasion by the Blemmyans, a people akin to the Bugaitæ, the modern Beja, Diocletian moved the Nobatæ, negro tribes of the same stock as the population of Kordofan, from the oasis of Khargeh into the Nile valley. In the sixth century A.D. the Christian Kingdom of Dongola (q.v.) was founded. See NUBIA.

Kingdom of Aksum. The mountain region of Abyssinia was probably inhabited in very early times by Semites as well as by Hamites. Whether the original home of the former was in Africa or in Arabia (see SEMITES), the overflow of population would naturally set in the direction of this Alpine country. As the native name shows, the Semitic Ethiopians were still in the nomadic state when they entered this territory, priding themselves on being "wanderers" roaming freely wherever they liked. (See GEEZ.) There were evidently successive waves of immigration. If the Egyptian Hbst is of Semitic origin, as can scarcely be doubted, there were apparently kinsmen of the Yemenites in Eretria and on the Somali coast c.1500 B.C. Sabæan inscriptions found in Yeha, the ancient Awa, may be as old as the seventh century B.C. Names of places such as Alwa, Daro, Sant, Harar, Hasak, and Awa are manifestly of South Arabian origin and seem to indicate a trade route between Yemen and Meroë lined with Semitic settlements long before the Christian era. As long as the Ptolemies dominated the Erythrean coast from Adulis, Berenice, and Arsinöe, a strong Abyssinian kingdom could not well develop. But in the reign of Augustus, when the Romans suffered serious reverses in Arabia and were occupied in Africa with Queen Candace, while the Arsacid conquests in eastern Arabia forced the Yemenite states to seek compensation for their losses elsewhere, the Semitic element in Ethiopia seems to have been reënforced, and the Kingdom of Aksum founded. The *Periplus Maris Erythræi*, possibly written by Basiles between 56 and 67 A.D., refers to a king of Aksum by the name of Zoscales, who controlled the coast from Massowah to Bab el Mandeb and was a friend of Greek culture. It is possible that some of the gold coins with Greek legends that have been preserved should be assigned to the second and third centuries A.D. Ten kings are known through these coins, viz., Aphilas, Bachasa, Gersem, Uzas, Nezana, or Aizana, Ulzeba, Azael, Uchsas, and Esbaal, or Aieb. Those that have the mark of the cross are clearly from the fourth and following centuries, but those without such a mark are probably earlier. On a marble throne in Adulis, Cosmas Indicopleustes in 545 A.D. found and copied an inscription commemorating the power of a great king whose name is not given. He has been supposed by some scholars to be the founder of the Aksumite kingdom, but it is more probable that he reigned at the end of the third century A.D. He possessed a part of southwest Arabia and fought with the Kasa (Cush) and the Buga (Beja). The Γάζα ἔθνη that he mentions as his subjects are probably the Agazi or Geez tribes. King Aizana is known to have reigned in the year 356 A.D. A trilingual inscription (Greek, Sabæan, and Geez) belongs to his pagan period; an inscription in Geez comes from his Christian period. For in his time Frumentius (q.v.) preached Christianity in the country. The political relations that had long existed between Aksum and Rome were such as to favor his mission. Ela Amida, his successor, who reigned before 378, still held control of parts of Yemen. One of the two Rüppell inscriptions written in the peculiar vocalized writing of the Geez (see ETHIOPIC WRITING) probably belongs to his reign. In 378 Aksum was reduced to its African territory. The names of some kings of the next century may be represented on the coins. Only a few can be deciphered with any degree of certainty on the copper coins, viz., Mehigsen, King of Aksum; Hatasu, King of Aksum; King Elaats; and King Zwasan. In 525 A.D. Elesbaha, King of Aksum, with the aid of the Sabæan and Hadramautian rulers, made an end to the Himyarite Kingdom of Dhu Nuwas, and Ethiopia again controlled Arabian territory. Before the end of the century, however, the Aksumites were driven back to Africa and never again extended their conquests to Arabia. In the seventh century Abraha gave refuge to the followers of Mohammed; and in 687 there was war between Aksum and Nubia. According to a letter addressed by a king of Aksum to a king of Nubia in the time of the Patriarch Philotheus of Alexandria (980–1002), preserved in a fourteenth-century *Life of the Patriarchs* and in the Ethiopic *Synaxar*, a woman who reigned over the Beni el Hamuna had recently invaded the country, burned churches and monasteries, and driven him from place to place. Marianus Victor (1552) speaks of this woman as the founder of the Zague Dynasty and as having married a ruler of the Province of Bugna. Later legends made of her a Jewess. She was probably a queen of the reigning family who married a prince of the Beni el Baguna, a name afterward corrupted into Beni el Zague. Eleven kings of the so-called Zague Dynasty reigned until 1270.

The most famous of these is Lalibula (c.1200 A.D.). In 1270 Yekuno Amlak restored the old line. Yekuno Amlak removed his residence to Tegalet in Shoa, but Aksum still remained the city where the kings were crowned. His successor was Wedem Raad (1291–1314). Amda Sion (1314–44) was a powerful king who fought bravely with his Muslim neighbors. Saifa Arad (1344–72) carried on a successful war in Upper Egypt against the Sultan on behalf of the Patriarch of Alexandria. His successors were Wedem Asfare (1372–82), and his brother, Dawit I (1382–1411), Teodoros I (1411–15), Yishak (1415–30), Andrias (1430), Takla Maryam (1430–34). Zara Yakob (1434–68) was a brave warrior and an able administrator. He was followed by Baeda Maryam (1468–78) and Eskander, or Alexander (1478–95), in whose time Cavilham visited the country. Amda Sion II (1495) and Naod (1495–1508) were of less importance. But Dawit II, called Lebna Dengel, in his battles with Adal showed himself to be a good soldier. Asnaf Sagad (1540–59) conquered Ahmed Granje, King of Adal, but in his reign the Gallas invaded the country. After the reign of Minas (1559–63) Sarsa Dengel came upon the throne (1563–97). This monarch destroyed Adal and fought successfully with the Gallas. In the time of his successors, Yakob (1597–1603, 1604–07), Za Dengel (1603–04), Susneus (1607–32), and Fasiladas (1632–67), religious difficulties occupied much attention. The power of the following kings was greatly limited by the Galla chiefs that ruled in many districts. They were: Johannes (1667–82), Jasus I (1682–1706), Takla Haimanot I (1706–08), Theophilus (1708–11), Justus (1711–16), Dawit III (1716–21), Bakafa (1721–30), Jasus II (1730–55), Joas (1755–69), Johannes II (1769), Takla Haimanot II (1769–77). On the more recent history see ABYSSINIA.

Ethiopic Language. The earliest monuments of Semitic speech in Ethiopia are the inscriptions found at Yeha. These are written in the consonantal Sabæan script. But while the presence of the article *an* appended to the noun and a final *m* to show indetermination is a sign of close affinity to the Sabæan, both syntax and vocabulary indicate that the writers used the *lesana Geez*, the language of Semitic Ethiopia, possibly as early as the seventh century B.C. The bilingual inscription (Greek and Ethiopic) exhibits essentially the same speech. So far as the language is concerned, there is not much difference between it and the Rüppell inscriptions which are written in the syllabic script characteristic of Ethiopic manuscripts. These Aksum monuments present the same type of language as the literary documents. Geez probably continued to be spoken by the common people until the Zague Dynasty came into power. From that time the Amharic probably began to gain upon the classical tongue. Yekuno Amlak, in 1270, made the former the official language, and Geez henceforth became the language of books and of the church, and as such had a second flourishing period. In its general structure and vocabulary Geez is closer to the Sabæan than to classical Arabic, but in some respects it has features that are younger than the latter. Thus the case endings have disappeared; the old passive is lost; aspirated dentals are changed into sibilants. Geez appears to have dropped the article some time before our era. As a substitute anticipating suffixes are used as in Aramaic, and also demonstrative pronouns. Of a dual there are only a few remnants. The verb has a simple stem, a causative formed by a prefixed *a*, a second causative in *as*, a reflexive in *ta*, another in *an*, and a third in *tan*, and a causative reflexive in *ast*, each of these permitting five vowel changes to indicate shades of meaning. The indicative and the subjunctive of the imperfect are strictly distinguished. The vocabulary has been greatly enlarged by Hamitic words. There are also some Greek and Aramaic loan words. Geez is to-day represented by two dialects, Tigre and Tigrai, or Tigrina. The latter is spoken in Tigre and has been much influenced by the Amharic; the former is spoken in the districts north and northwest of Tigre and shows greater similarity to the old Geez. Amharic has developed many peculiarities not found in any other Semitic language, but characteristic of the Hamitic languages.

Ethiopic Literature. Reference has already been made to the early inscriptions. On the translation of the Bible, see under BIBLE, the section on *Versions*. The Ethiopic Old Testament contains, in addition to the canonical books, also the Apocrypha (except the Books of Maccabees), and a number of works, such as the Book of Enoch, the Ascension of Isaiah, the Book of Jubilees, and the Apocalypse of Ezra. These additions have all been published; but many of the canonical books are extant only in manuscripts. Several apocryphal books are also appended to the New Testament, among them a *Synodos*, which includes canons of councils, an exposition of the Nicene Creed, apostolic constitutions, and other matter. The remaining literature is mainly theological, and includes translations of Greek fathers, liturgies, lives of saints, monastic rules, hymns, and the like. A so-called *Antiphonary* contains a musical notation. The *Savasev* are very imperfect studies of the language. Catalogues of the principal collections have been published.

Consult: Erman, *Aegypten und aegyptisches Leben im Alterthum* (Tübingen, 1885); W. M. Müller, *Asien und Europa nach altägyptischen Denkmälern* (Leipzig, 1893); Maspero, *Histoire ancienne des peuples de l'Orient classique* (Paris, 1895–99); Breasted, *History of Egypt* (New York, 1909); id., *Temples of Lower Nubia* (Chicago, 1906); id., *Monuments of Sudanese Nubia* (ib., 1908); Reisner, Firth, Smith, and Jones, in *The Archæological Survey of Nubia* (London, 1907–10); *Reports of the Coxe Expedition* by MacIver, Woolley, Mileham, Griffith (ib., 1909 et seq.); Ward, *Our Sudan: Its Pyramids and Progress* (ib., 1905); Budge, *The Egyptian Sudan* (ib., 1907); Ludolf, *Historia Æthiopica* (Frankfort, 1681); Tellez, *Historia general de Ethiopia* (Coimbra, 1660); D'Almeida, *Historia de Ethiopia alta* (ib., 1660); Bosset, "Etudes sur l'histoire d'Ethiopie," in *Journal Asiatique* (Paris, 1881); Dillmann, *Ueber die Anfänge des axumitischen Reiches* (Berlin, 1879); Perruchon, "Notes pour l'histoire d'Ethiopie," in *Revue Semitique* (Paris, 1893); Glaser, *Die Abyssinier in Arabien und Afrika* (Munich, 1895); Bent, *The Sacred City of the Ethiopians* (London, 1893); Bruce, *Travels in Abyssinia* (Edinburgh, 1768–73); Hoskins, *Travels in Ethiopia* (London, 1835); Dillmann, *Grammatik der äthiopischen Sprache* (Leipzig, 1859; 2d ed., by Bezold, 1899); Prætorius, *Die amharische Sprache* (Halle, 1879); id., *Grammatik der tigrina Sprache* (1871); Schrieber, *Manuel de la*

langue tigraï (Vienna, 1887); Goldschmidt, *Bibliotheca Æthiopica* (Leipzig, 1892); Fumagalli, *Bibliografia Etiopica* (Milano, 1893); Rossini, in *Rendiconti dell' academia dei Lincei* (Rome, 1899); Beccari, *Documenti inediti per la storia d'Etiopia* (Rome, 1903); Littmann, *Die deutsche Aksum-Expedition* (Berlin, 1913).

E′THIO′PIAN CHURCH. See Abyssinian Church.

E′THIO′PIANISM. The name given to a movement in South Africa which under the guise of religious teaching preaches the overthrow of white domination, or "Africa for the Africans." It was started about 24 years ago by two native ministers who seceded from the Wesleyan body and started the Church of Ethiopia, exclusively for blacks. One of the two, named Dwane, visited the United States and obtained for his organization the recognition of the powerful African Methodist Episcopal church, the affiliation being confirmed when Bishop Turner visited Africa in 1898 and ordained a large number of Kafir ministers. Dwane subsequently approached the Archbishop of Capetown, seeking some kind of affiliation with the Anglican church, and from this grew an obscure recognition of what is called the Order of Ethiopia. To counteract this schism the African Methodist Episcopal church in America sent out Dr. Levi Coppin, of Philadelphia, as Bishop of its South African branch, which has become firmly established and is absorbing the native converts of the English Methodist missions. In addition the Transvaal mines, in bringing together thousands of native laborers from every part of Africa south of the Zambesi, have served to further the sentiment of a community of interest among the Kafir population. The Herero uprising of 1904 and the Zulu outbreak of 1906 in Natal are supposed to have been influenced by Ethiopian agitators. Since that time, however, little or nothing has been heard from this movement.

ETHIOPIAN PEPPER. See Guinea Pepper.

ETHIOPIAN REGION. In zoögeography, Africa south of the Sahara, and including Madagascar, i.e., the Paleotropical Region (q.v.). See Distribution of Animals.

E′THIO′PIC. See Ethiopia; Ethiopic Language; Ethiopic Literature; Ethiopic Writing.

E′THIOP′IC VERSION. See Bible.

ETHIOPIC WRITING. The language of the Semitic Ethiopians, the *lesana Geez* (see Geez), was at first written in the same characters that were used by the Minæans and Sabæans. The origin of this South Arabian system of writing is still obscure. While some epigraphists regard it as a modification of the Phœnician alphabet, others are inclined to ascribe to it an independent origin. (See Alphabet; Minæans.) The earliest Ethiopic inscriptions are written *boustrophedon*, i.e., as the ox plows—one line running from right to left, the next from left to right. Later the direction from left to right prevailed, as in the Greek. Probably in the fourth century the Sabæan alphabet was modified by the introduction of a peculiar method of vowel notation. The various long or short vowel sounds were indicated by a lengthening or shortening of certain strokes or the addition of a stroke, a hook, or a circle. The signs thus became designations of syllables, and by 182 characters it was possible to express clearly the pronunciation of each word. It has been supposed by some scholars that this was an imitation of the Syriac vowel system. But the date of the Rüppell inscriptions renders it more probable that the changes were suggested by missionaries familiar with the Indian *brahma lipi* or *karoshthi* alphabets. Consult Dillmann, *Grammatik der äthiopischen Sprache* (2d ed., by Bezold, Leipzig, 1899).

E′THIOPS (Lat., from Gk. *Αἴθιοψ*, *Aithiops*, Ethiopian; so called from the color), or **ÆTHIOPS.** A term applied by alchemists to certain black oxides and sulphides that were used in medicine. *Martial ethiops*, or black oxide, a ferrous and ferric oxide prepared by keeping iron filings under water, was used as a tonic. *Mineral ethiops*, mercuric sulphide with an excess of sulphur, was made by mixing together equal parts of mercury and sulphur in a stoneware mortar and was used as a vermifuge and alterative. *Ethiops per se* was made by agitating mercury with access to the air. *Vegetable ethiops*, the plant bladder wrack heated in a closed vessel until it became black, was used as a remedy for scrofula and similar diseases.

ETH′MOID BONE (Gk. *ἠθμοειδής*, *ēthmoeidēs*, like a sieve, from *ἠθμός*, *ēthmos*, sieve, from *ἤθειν*, *ēthein*, to sift + *εἶδος*, *eidos*, form). One of the eight bones which collectively form the cavity of the cranium. It is of a somewhat cubical form and is situated between the two orbits of the eyes, at the root of the nose. Its upper surface is perforated by a number of small openings (whence its name), through which the filaments of the olfactory nerve pass downward from the interior of the skull to the upper part of the nose. It consists of two lateral masses, attached on each side of a vertical central plate, or lamella, which articulates with the vomer and with the central fibrocartilage, and thus assists in forming the septum or partition between the two nostrils. Each of the lateral masses is made up of two scrolls (turbinates) and is so planned as to give in a small space a very large amount of surface, on which the filaments of the olfactory nerve are spread. See Nose; Smell.

ETH′NIC PSYCHOL′OGY. See Psychology, Ethnic.

ETHNOG′RAPHY (from Gk. *ἔθνος*, *ethnos*, people + *-γραφία*, *-graphia*, description, from *γράφειν*, *graphein*, to write). That branch of anthropology which is concerned with the systematic description of races and peoples. See Ethnology.

ETHNOL′OGY (from Gk. *ἔθνος*, *ethnos*, people + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). Though formerly ethnology and ethnography were two distinct sciences, the present tendency in America is to use "ethnology" as including all studies of living races, thus making it one of the three main branches of anthropology. "Ethnography" appears in literature at the beginning of the last century as synonymous with a description of nations or peoples. "Ethnology" seems to have first appeared in the title of the Society of Ethnology of Paris in 1839, where it was used to include all studies of living races. Both terms became current in France, England, and Germany, where a distinction was finally made, "ethnography" being used to designate the systematic descriptions of the various groups of nonhistorical peoples, "ethnology" the synthetic and analytic uses of the data so acquired to determine the classification of peoples, the causes leading to changes of culture, etc. According to this use of the two terms, the physical or anatomical characters as employed in the classification of races fell within the domain of ethnology, as also classification by languages. However, the specialized nature and complexity of problems arising from the study of man's physical characters soon brought about a differentiation which ultimately led to the recognition of physical anthropology as a distinct science. In recent years for similar reasons the study of languages has been recognized as equally distinct. (See ANTHROPOLOGY.) Hence American anthropologists now use the term "ethnology" as the collective name for all studies of living nonhistorical peoples exclusive of language and anatomy. Yet these distinctions are not absolute, for all are but the subdivisions of one science, anthropology.

The ethnology of a tribe should include full descriptive data upon the following:

1. *Habitat.* Location, movements, geographical environment, and history.
2. *Material Culture.* Food, shelter, transportation, dress, manufactures, and industrial arts.
3. *Art.* Graphic art, decorations of all kinds, symbolic interpretation of designs, religious art.
4. *Social and Political Organization.* Marriage customs, social groups, division of labor, property, government, regulation of health, education, social ideals, war, games and amusements, burial customs.
5. *Religion and Ceremonies.* Religious concepts, ideas of the world, assumed supernatural relations, shamanistic practices, enumeration and description of all ceremonies, songs (dancing and music).
6. *Mythology.* Recorded folk tales and sayings.

To this should be added a general comparative statement showing the relation of the tribal culture to the cultures of its neighbors and such conclusions as the data warrant on the origin and historic development of the most important traits.

Certain general problems are the particular concern of ethnologists, though all such are likely to transcend the strict bounds of ethnology and become truly anthropological problems; among these are the significance of clan and other family systems, the existence or nonexistence of important mental differences among the various divisions of mankind, the relation of culture to environment, and the manner in which cultures evolve. See ANTHROPOLOGY; MAN, SCIENCE OF. Consult: E. B. Tylor, *Primitive Culture* (2 vols., New York, 1891); F. Ratzel, *History of Mankind* (3 vols., ib., 1904); J. Deniker, *The Races of Man* (London, 1900); A. H. Keane, *Ethnology* (2d ed., New York, 1906) and *Man Past and Present* (ib., 1900); F. Boas, *The Mind of Primitive Man* (ib., 1911); for an extensive bibliography, see W. I. Thomas, *Source Book for Social Origins* (Chicago, 1909). See the paragraphs *Ethnology* under the names of countries.

ETHNOLOGY, BUREAU OF AMERICAN. See SMITHSONIAN INSTITUTION.

ETHOL'OGY. See BIONOMICS.

ETH'YL (from *eth-er* + *-yl*), C_2H_5. A radical, or group of atoms, often found in chemical compounds of carbon, but incapable of independent existence. See CHEMISTRY (section on the *History of Chemistry*) and CARBON COMPOUNDS.

ETH'YLAM'INE (from *ethyl* + *-amine*, from *am*-monia + *-ine*), $C_2H_5NH_2$. An organic base produced when a monohalogen substitution product of the hydrocarbon ethane is heated with a solution of ammonia in alcohol. The most convenient method of preparing ethylamine consists in gently warming propion-amide ($C_2H_5CONH_2$, the amide of propionic acid) with bromine and an excess of caustic potash, the transformation taking place in two steps, according to the following chemical equations:

$$1.\ \underset{\text{Propionamide}}{C_2H_5CONH_2} + Br_2 + KOH = \underset{\text{Bromo-propionamide}}{C_2H_4CONHBr} + KBr + H_2O$$

$$2.\ \underset{\text{Bromo-propionamide}}{C_2H_5CONHBr} + 3KOH = \underset{\text{Ethylamine}}{C_2H_5NH_2} + KBr + K_2CO_3 + H_2O$$

Ethylamine is a colorless, inflammable liquid boiling at 18.7°. It resembles ordinary ammonia in odor and in other properties, combines with acids to form crystalline salts, and forms double salts with the chlorides of gold, platinum, etc. When treated with nitrous acid, it is changed to alcohol; and when warmed with chloroform and caustic potash, it is converted into ethyl isocyanide (a carbylamine having the formula C_2H_5NC), which may be readily recognized by its extremely disagreeable odor. See also AMINES.

ETH'YLENE (from *ethyl* + *-ene*), or OLEFIANT GAS, C_2H_4. A gaseous compound of carbon and hydrogen having a peculiar sweetish odor. It is colorless and but sparingly soluble in water. In the presence of "platinum black" (finely divided platinum), it combines with hydrogen to form the hydrocarbon ethane. Ethylene is formed in the dry distillation of coal and is therefore one of the constituents of ordinary illuminating gas, to whose flame it imparts considerable luminosity. It is prepared in chemical laboratories by heating a mixture of strong alcohol and concentrated sulphuric acid, the alcohol being thus broken up into water and ethylene. Senderens showed, in 1910, that the yield of ethylene is materially increased if some aluminium sulphate is added to the sulphuric acid.

Ethylene is one of those carbon compounds that are capable of combining directly with the halogens, forming "additive products"; thus, with bromine it forms the compound $C_2H_4Br_2$. It is therefore classed with the so-called unsaturated compounds, of which it is the simplest representative. It similarly combines with hydrobromic acid (especially in the presence of aluminium bromide), forming ethyl bromide, C_2H_5Br, and with hydriodic acid, forming ethyl iodide, C_2H_5I. See DUTCH LIQUID.

ETHYLINE DICHLORIDE. See DUTCH LIQUID.

ETHYL NITRATE. See NITROUS ETHER.

ÉTIENNE, ā'tyĕn'. See STEPHANUS.

ÉTIENNE, CHARLES GUILLAUME (1778–1845). A French playwright and journalist, born near Saint-Dizier, Haute Marne, France. During the Revolution he held several municipal offices. As secretary to Hugues Bernard Maret, Duc de Bassana, he participated in Napoleon's campaigns in Italy, Germany, Poland,

and Austria. His comedy *Les deux gendres* (1810) gained his election to the Academy in 1811, but it was also the subject of a bitter controversy, for Etienne was charged with plagiarism. He was editor in chief of the *Journal de l'Empire*. His works include: *Le rêve* (1799); *Histoire du théâtre français* (4 vols., 1802), with Alphonse Dieudonné Martainville; *La jeune femme* (1804); *Brueys et Palaprat* (1807); *Cendrillon* (1810); *L'Intrigante* (1812); *Joconde* (1814).

ÉTIENNE DU MONT, ā'tyĕn' du mōN, SAINT (Fr., St. Stephen of the Mount). One of the most beautiful churches of old Paris, founded in 1220 and rebuilt from 1517, but not completed till 1626. It has a beautiful carved bridgelike choir screen in stone (end of sixteenth century), a feature which is unique in Paris. The church contains the shrine of St. Genevieve, dating from the thirteenth century, and is the burial place of Pascal and Racine.

ETIOLA'TION (from Fr. *étioler*, to blanch, OF., *estioler*, from *esteule*, stubble, from Lat. *stipula*, straw). The change in appearance and structure of the plant caused by growth in absence of light. Chlorophyll is lacking in etiolated dicotyls and monocotyls, and its absence makes the yellow pigment carotin (q.v.) (formerly called etiolin) evident. The structural modifications are of much more significance and are marked by elongation of internodes and petioles, reduction in size and differentiation of the leaf blade, and by lack of development of mechanical tissue. The elongation of the internode more commonly occurs in dicotyls and that of the petiole in monocotyls; hence the two types are termed respectively dicotyledonous and monocotyledonous. Red light, free from blue or violet rays, produces all the etiolation effects except lack of chlorophyll. It is seen, then, that the more refrangible portion of the spectrum is the important portion in determining growth and structural modifications in plants. Étiolation is not limited to monocotyls and dicotyls, but appears in gymnosperms, ferns, mosses, algæ, and fungi.

ET'IOLIN (from Fr. *étioler*, to blanch). A name formerly given to the carotin (q.v.) appearing in etiolated plant structures.

ETIQUETTE, ĕt'ĭ-kĕt (OF. *estiquette*, *etiquette*, Fr. *étiquette*, from OHG. *stehhan*, Ger. *stechen*, to stick). Originally etiquette signified a slip of paper—ticket, label—affixed to a bag or other object to indicate its contents. The word came to possess the secondary meaning which we now attach to it—of "prescribed routine," or the various decorums observed in the intercourse of life, more particularly on state occasions—seemingly from the old custom of delivering such tickets, instructing each person who was to share in a ceremony as to the part he or she was expected to play in it. The cards on which the order of the dances is set forth at balls and evening parties are of this nature. The word is much used in certain professions the members of which are in honor bound to observe particular unwritten codes of conduct upholding the dignity of their respective callings. Thus, we have "medical etiquette," "legal etiquette," etc.

ÉTIQUETTE, ā'tē'kĕt', MADAME. The popular name applied to the Duchess de Noailles from her rigid application of formalities as mistress of ceremonies at Marie Antoinette's court.

ETIVE, ĕt'ĭv. A sea loch in the north of Argyllshire, Scotland, running inland from the Firth of Lorne (Map: Scotland, C 3). The river Awe, the outlet of Loch Awe, and the small river Etive flow into it. The loch abounds in salmon. The scenery around the upper half of the loch is mountainous and romantic. The ruins of Ardchattan Priory and of Dunstaffnage Castle add to its interest.

ET'LAR, CARIT. See BROSBÖLL, JOHAN CARL CHRISTIAN.

ET'NA, or **MONGIBELLO,** mōn'jē-bĕl'lō (Lat. *Ætna*). The largest active volcano in Europe. It is an isolated mountain on the eastern coast of Sicily near the city of Catania. It is cut off from the surrounding mountains on the north by the valley of the Alcantara and on the south and southwest by the valley of the Simento. Its eastern side rises directly from the Mediterranean, which here has a depth of 5000 to 6000 feet. The base of the volcano measures about 90 miles in circumference. The ascent, gradual at first, leads with increasing slope to the summit, about 10,758 feet above the sea. The general appearance of Etna is that of a massive lava cone, whose regularity of outline is broken by fissures and by numerous subsidiary cones. Of the latter there are more than 200 located at irregular intervals on the mountain sides, some reaching a height of 700 feet. The cone occupied by the present principal crater rests upon a terrace which marks the site of an ancient larger cone that was probably destroyed by an explosion. On the eastern slope is a vast amphitheatre called the Val del Bove, with precipitous sides nearly 3000 feet high, which was once the centre of eruption and which affords a remarkable view of the volcano's structure and its development during the repeated eruptions. The summit of Etna, except where covered with snow, presents a dreary waste of dark lava, scoriæ, and ashes. Lower down there is a stretch of woodland with pine, oak, beech, and poplar. A varying breadth of from 2 to 11 miles of cultivated region surrounds its base, producing grain, oil, wine, fruit, and aromatic herbs. Snow persists throughout the year in the fissures of the summits, and on the exposed portions for about eight months. An observatory and a house for the convenience of travelers have been erected on the terrace just beneath the crater.

The eruptions of Etna are on a grander scale than those of Vesuvius, but they are not of so frequent occurrence. There are records of 11 eruptions previous to the Christian era, the first occurring in 476 or 477 B.C. The most remarkable in later times are the following: the eruption of 1169 A.D., when Catania and 15,000 of its inhabitants were destroyed; that of 1527, when two villages were buried and many human beings perished; that of 1669, when the flow of lava was directed again towards Catania and is said to have killed 20,000 people; and the eruption of 1693, when a still larger number of people are said to have been destroyed. A violent eruption took place in 1852, and immense quantities of volcanic dust fell over the adjacent country. Great torrents of lava also issued from two new fissures on the eastern flank, one of which was nearly 2 miles in length. The next outbreak, in 1864-65, was of trifling importance. That of May, 1879, was much more violent, the clouds of smoke and showers of ashes being followed by the ejection of a stream of lava which desolated a large tract of highly cultivated land. Eruptions occurred in 1886 and 1892 and a violent outbreak in 1911, when a stream of lava, one-third of a mile wide, flowed down the northeastern slope towards the Alcantara valley. The last eruption was accompanied by the formation of several new craterlets. See SICILY.

ET′NA. A borough in Allegheny Co., Pa., on the Allegheny River, opposite Pittsburgh, and on the Baltimore and Ohio and the Pennsylvania railroads (Map: Pennsylvania, B 6). It is a flourishing industrial centre and has rolling mills, furnaces, steel mills, galvanized-pipe works, and other manufactures. The water works and electric-light plant are owned by the borough. Pop., 1900, 5384; 1910, 5830.

E′TON. A town in Buckinghamshire, England, in the parliamentary borough of Windsor, on the left bank of the Thames, 42 miles south-southeast of Buckingham and 22 miles west of London (Map: London, E 1). It lies opposite Windsor in Berkshire, with which it is connected by a bridge over the Thames. Eton chiefly consists of one long, well-paved street, is lighted by electricity, and has a modernized sewerage system. It derives its importance from the ancient and famous Eton College (q.v.). Pop., 1901, 3301, 1911, 3192.

E′TON COLLEGE. One of the oldest and most famous public schools in England. It was founded in 1440 by Henry VI as "The College of the Blessed Mary of Eton beside Windsor." The establishment was constituted for a provost, 10 priests, 4 clerks, 6 choristers, 25 poor grammar scholars, a master, and 25 poor infirm men, and was provided for out of the royal demesne lands and the estates of certain alien priories. The whole plan was modeled on that of Winchester and contemplated a connection between Eton and King's College (q.v.), Cambridge, such as existed between Winchester and New College, Oxford. In 1441 a supplementary charter was granted to the new foundation, and the college buildings were begun, but were not entirely finished until 1523. The first head master of the school, later one of its most munificent benefactors, was Bishop Waynflete (q.v.). The college has had a long and honorable history. Its roll of worthies comprises many great names, especially during the eighteenth century. It includes Sir Robert Walpole, Robert Harley (Earl of Oxford), Henry St. John (Viscount Bolingbroke), the elder Pitt, Lord North; Charles James Fox, Horace Walpole, the Duke of Wellington, the poets Gray and Shelley, and Gladstone. The increasing value of the estates of the college, together with additional gifts, has made it very wealthy. By the Public Schools Act of 1868 the original foundation was greatly modified. The governing body now consists of a provost and 10 fellows, nominated by an electorate, which includes such bodies as Oxford and Cambridge universities. There are a number of scholarships besides those on the regular foundation, and the plan of connecting Eton with King's College was so far carried out that a number of scholarships at the Cambridge college are exclusively for Eton men. There are 72 scholars on the foundation. The total number of pupils in the college in 1913 was 1019; the nonscholars, a class admitted very early in the history of the institution, are known as "oppidans," who may, and in a very few cases do, live out of the college. There are two schools, an upper for the older boys and a lower for the younger, managed by a head master and an assistant, or lower master. The teaching force is large. Here, as at most English public schools, the education is largely classical, though here, as elsewhere, natural science, mathematics, history, the modern languages, and the like made places for themselves in the last half of the nineteenth century. An army class provides special preparation for those who are intending to take the army examinations. The buildings, which are very beautiful, consist of two groups, of which the older, containing the chapel, hall, and library, the apartments of the provost, master, and fellows, incloses two quadrangles. The boys' library and sleeping apartments form the new buildings attached to the northern side of the older group. (Consult Gray, *Ode on a Distant Prospect of Eton College.*) For worthies of Eton, consult Creasy, *Eminent Etonians* (London, 1848), a series of brief biographies of its principal members, with a sketch of the college. For general history of the school, consult Sir H. Maxwell-Lyte, *History of Eton College* (London, 1904), and Cust, *History of Eton College, 1440–1898* (ib., 1899). See also MONTEM CUSTOM.

ETOROFU, ȧ-tō′rō-fo͞o, or **ITURUP,** ē′to͞o-ro͞op′. The largest of the Kurile Islands, belonging to Japan, situated between the islands of Kunashiri and Urupp and crossed by the meridian 148° E. Area, about 1500 square miles. It is of volcanic origin and contains an active volcano. Pop., about 1350.

ETOSA LAKE. See KUNENE.

ÉTOURDI, ā′to͞or′dē′, L' (Fr., The Unmindful One). A five-act comedy by Molière, produced at Lyons in 1653.

ÉTRETAT, ā′tre-tȧ′. A fashionable watering-place in the Department of Seine-Inférieure, France, on the English Channel, 18 miles northeast of Havre (Map: France, N., F 3). It is picturesquely situated at the foot of high cliffs, has a fine beach, casino, and bathing establishment, a Romanesque church, several hotels, and numerous attractive summer cottages. It is a favorite resort for literary men and artists. Pop. (commune), 1901, 1944; 1911, 1973.

ETRU′RIA. The people called by themselves the Rasena, by ancient writers Tyrrheni and Tusci, and in modern times Etruscans, are among the mysteries of history. Though scattered at one time over a larger part of Italy, the centre of their power was in the region bordered on the north by the valley of the Arno, on the east and south by the Apennines and the Tiber. This was Etruria proper. There were also two other regions colonized by the Etruscans—the valley of the Po in the north and the plains of Campania in the south. They formed the most advanced civilization in central Italy before the dominion of Rome.

Origin and History. Critics do not agree as to the origin of the Etruscans. One school makes them come by land across the Rhætian Alps, with their earliest settlement in the north and inland. A second school believes them to have come by sea. Herodotus believed them to be Lydians. Some modern writers connect them with the Pelasgians or Hittites. They certainly appear to have come from Asia Minor. Their own legends place the beginning of their power in Italy in 1044 B.C. The discoveries in the necropolises of Etruria would place the rudest of the early tombs at a period only slightly subsequent to this date. For several centuries the tribe remained stationary and retired, probably in the region of Monte Amiata and the Ciminian forest, though there may have been other centres as well. Between the eighth and sixth centuries B.C. the tribe embarked on a career of conquest among the earlier nations of central Italy. The earliest cities to be subdued were those along the seaboard, such as Tarquinii and Cære, and only quite late did inland cities like Perusia and Arretium fall into their hands. The Etruscans in many cases appear to have found among the conquered a more advanced civilization, but their superior organization and vigor made them conquerors. They formed probably the governing class, an aristocratic oligarchy. For a time there were three separate Etruscan confederacies, each composed of 12 cities or states. The southern confederacy (Etruria Campaniana) included Capua and Nola; the northern (Etruria Circumpadana) Felsina, Mantua, Ravenna, and Hadria. The central confederacy alone counts in history as important and included many more important cities than the necessary 12: Tarquinii, Cære, Veii, Vulci, Volsinii, Falerii, Nepete, Sutrium, Populonia, Russellæ, Clusium, Vetulonia, Volaterræ, Perusia, Cortona, Arretium were the largest, and the 12 confederates are probably to be found among them, the list varying at different times. Each separate state was governed by magistrates annually elected, with the titles of Lucumo (Lauchme), Porsena (Purtevana), and Marunuch, chosen from the ranks of the hereditary priestly nobles. In times of war a single supreme chief was chosen—like Porsena of Clusium—and his bodyguard consisted of 12 lictors, one from each city, as symbols of his authority. This is another point of resemblance with the Hittites, whose confederacy was similarly organized. The laws, both religious and civil, were embodied from early times in a triple series of books (*libri disciplinæ*), the first being the *libri haruspicini*, treating of divination by sacrifice; the second, the *libri fulgurales*, on divination by lightning; the third, the *libri rituales*, of more general import, treating of the founding and consecrating of cities and buildings, of the organization of the people, of the army, and the state in times of peace and war. Etruria was noted as a hotbed of superstition and profligacy even after her downfall.

The Etruscans are closely connected with the earliest history of Rome. According to an ancient tradition they formed the third constituent tribe of Rome, the Luceres; but this is no longer accepted by most authorities. It seems more likely that the tradition of the Tarquin kings represents an Etruscan conquest of Latium and Campania at some time before 600 B.C. After the expulsion of the Tarquins the Etruscans sought to reëstablish them by force under the leadership of the Porsena of Clusium (?509 B.C.). At this time the Etruscan cities were great commercial centres: those situated at a little distance from the seaboard had their special ports: Cære had Pyrgi, Vetulonia had Telamon, Tarquinii had Graviscæ. Their onward march in companies was shown by their attack on the Greeks of Cumæ in 523 B.C. The keen rivalry for commercial mastery then pending between the waning Phœnicians and the Greeks led Carthage to seek an alliance with the Etruscans, whose fleet must have been powerful and in control of local commerce. The terms of this treaty gave Corsica to the Etruscans and Sardinia to the Carthaginians. At this time the inland conquests of the Etruscans were substantially completed. Their first great defeat came in 474, when Hiero of Syracuse punished them for assisting the Athenians by practically annihilating their sea power. Between this time and the final destruction of their independence by Rome, at the battle of the Vadimonian Lake in 283 B.C., were two centuries of steady political decay, marked by their defeat by the Gauls, who overran Etruria Circumpadana; by the Umbrians, who attacked on the east; by the Samnites, who subjugated Etruria Campaniana, and by the Romans, whose progressive stages of conquest were marked by the capture of Veii in 396 B.C. after 10 years' siege, and by that of Falerii. But the practical nature of the Etruscans seems to have shown itself by the easy fashion in which they turned their downfall into a further opportunity for a life of ease and luxury without responsibility. But they felt the influence of the far higher civilization of Rome. Certainly up to the time of the Gracchi Rome could not compare in magnificence or wealth with any of the greater Etruscan cities.

Customs and Religion. Judging from the monuments, the Etruscans were a short and thickset people, with heavy features, much given to good living, games, and amusements. Dancing, music, and the theatre flourished; festivals were frequent and sumptuous. There was great love of pomp and ceremony and of rich costumes. The Roman use of the *toga picta* and *palmata* and of the *corona Etrusca* in the triumph, the lictors, the system of slavery and clientship, the love of theatrical and amphitheatrical shows, the organization into tribes, the system of divination, and many other important customs and beliefs were derived by the Romans from Etruria. The Etruscan pantheon, as we know it, is a late piece of patchwork. The supreme trinity was Tinia (Jupiter), Uni (Juno), and Menrfa (Minerva). Other principal deities were Sethlaus (Vulcan), Turan (Venus), Phuphlans (Bacchus), and Turms (Mercury). Mantus was the ruler of Hades with his consort Mania, assisted by Charun and the Furiæ. These *Dii consentes* had above them a series of nameless deities, inexorable as fate, probably the original Chthonian divinities before Greek influence began.

Language. The obscurity of Etruscan history is due largely to the absence of any literature and to the present inability to decipher the known inscriptions. The Etruscan language is still a mystery. The alphabet is clear. It contains 19 letters, derived from a Græco-Chalcidian prototype, which was first adopted along the southern seaboard. But critics have not yet even determined to what family the language belongs; the two principal theories are that it is Aryan or Semitic. Although about 6000 inscriptions have been found, they are nearly all (four-fifths) sepulchral and so short and largely composed of proper names that only about 200 other words have been detected. Only 15 inscriptions are bilingual, and these are of little use. The longest inscription, on the Perugia Cippus, contains 46 lines. A great deal is expected from the study of the recently discovered linen mummy cloths at Agram, containing over 200 lines of an Etruscan book. It was recognized in 1891 by Professor Krall, of Vienna. In such progress as has been made the stages have been marked by Lepsius' study of the alphabet, by Corssen's first attempt at laying a scientific basis for linguistic study (*Die Sprache der Etrusker*, Leipzig, 1874), and by the subsequent studies of Pauli and Deecke, who hold opposite theories. A few facts are known. The Etruscan language expresses relationship both by separate words and by suffixes; it possesses gender and enclitics; it does not distinguish accusative from nominative case; but has genitive (-s) and dative (-si or -thi) as well as plural (-r or -l).

Archæology and Art.—*Architecture.*—It is through archæological excavation that nearly everything known about the Etruscans has been discovered. More is known of Etruscan engineering than of architecture. The cities were carefully laid out on a quadrangular plan, with well-fortified citadels and walls; the walls were strengthened by towers and double gates. The Etruscans themselves used tufa and other stones squared and laid in horizontal courses, but there is some dispute whether the polygonal and irregular cyclopean masonry of some cities in Etruria was built by them or another and earlier race, perhaps the Pelasgians (q.v.). The city of Marzabotto, in the Province of Bologna, is the best instance of an Etruscan colony, laid out in regular streets, with pavements, sidewalks, and drainage. The Servian wall in Rome is of Etruscan construction. On the other hand, Russellæ, Cosa, Vetulonia, Veii, and other cities are built in the polygonal style. Almost nothing of Etruscan temple architecture remains. From Vitruvius, and the descriptions of the temple of Jupiter Capitolinus in Rome, from remains at Alatri, Satricum, Segni, Norba, and Falerii, it is evident that the Etruscans, Latins, Volscians, and other tribes adopted their temple from the early Greeks, taking as form the early temple *in antis* (not peristyle), with very deep portico. The usual material was a wooden core, covered with terra cotta, for columns, entablature, gables, etc., while the cella walls were of brick or stone. Hence their easy destruction by fire and disintegration. Nearly all the remains consist of the terra-cotta ornaments, such as antefixes (see ANTEFIX), sculptured friezes, and gable statuary. Marble sculpture, on account of its weight, could never be used in connection with these light wooden structures, but terra-cotta sculpture was carried to great perfection between the fifth and third centuries, as is shown by the remains at Satricum, Falerii, and Luni, which are unique in plastic history and in some cases purely Greek in style. The order employed was a modification of the Doric, called the Tuscan, the proportions of which, owing to the influence of the material, were much lighter; they can best be studied in Vitruvius and in early Roman examples copied from Etruscan buildings. In their tombs the Etruscans showed as much genius as the Greeks. Throughout Etruria there are large and early domical and vaulted tombs for great chiefs, which remind one of the tombs of the Homeric heroes and of the Lydian Alyattes. Such are those at Veii, Vetulonia, Vulii, Clusium, discovered full of antiquities, mostly imported from the East. These all date from the eighth, seventh, and sixth centuries. To another class, and certainly to the Etruscans themselves, belong the flat-roofed tombs imitated from the house, of which fine series exist at Cære and Perugia, dating between the sixth and third centuries B.C. These were often painted like the Egyptian tombs, with frescoes, from which we gain our principal knowledge, not only of Egyptian funeral rites, but of their beliefs and daily life. No remains of royal palaces or of public buildings have come to light, so that there is but a meagre remnant of Etruscan architecture.

Sculpture.—It is different with sculpture. In character Etruscan sculpture lacks beauty of style, poetry, and imagination. It is essentially utilitarian and material. Stone, bronze, and terra cotta were used at a very early date. It is either in the tombs, as at Vetulonia, or above them that the early stone sculptures are found, in the form of statues or steles carved in relief to mark the site. During this early stage (seventh to sixth century), when Oriental influence dominated, there was a peculiar mixture of realism and archaic style, as shown in the great terra-cotta sarcophagi at the British Museum, the Louvre, and the Papa Giulio Museum in Rome, in which the husband and wife are represented in life-size figures reclining on the funeral couch in conversation, while scenes in low relief are carved on the faces of the sarcophagus. Later, marble came into use for sarcophagi. Sometimes it was painted, as in the wonderful sarcophagus at Florence of the Hellenic period (fourth century); but when the burial after incineration became the rule the small carved ash urns were produced in thousands. The largest collections are in the Vatican, at Perugia, Florence, Corneto, etc. Their scenes are very instructive as to Etruscan mythology, but they show a great and growing dependence on Greek thought. Bronze sculpture was an Etruscan specialty. Even the Greeks recognized this fact and imported the Etruscan works. This was the case not only with statues, like the Mars of Todi and the Orator of Florence, with busts like the Brutus in the Capitol, and with statuettes innumerable, but with articles of furniture and decoration, such as candelabra, jewel cases, the famous *cistæ*, and mirrors. The Ficoroni cista, with its exquisite engraved scenes, belongs to a class not found elsewhere in the artistic world. Many of the mirrors also are beautifully engraved with figured scenes.

Minor Arts.—The Etruscan tombs, beginning in the eighth century, are filled with a wealth of objects unparalleled except in Egypt, and excavations do not seem to exhaust their riches. Their contents, however, do not illustrate merely Etruscan, but ancient Oriental and Greek, art as well, especially in the cities of maritime and southern Etruria. This is the case especially with gold jewelry (q.v.) and vase painting. It is now quite certain that a large part of what has generally been called Etruscan jewelry came to Etruria from Greece, and the great majority of Attic and other Greek vases have been recovered in this way. The tombs of Orvieto (Falerii) are especially rich in Greek vases, many of them signed. It is easy to distinguish the native Etruscan ware; not so easy the jewelry. Of the jewelry, arms, and armor there were two classes—that for use and that made as a votive offering and for burial. The latter class was extremely fragile and light. The Etruscan women were famous for the amount and richness of their jewelry wreaths and coronets, pins, earrings, necklaces, fibulas, breastplates, armlets, bracelets, and rings. The great use of jewelry, while commencing as early as the seventh century, seems not to have reached its climax until the fourth century. The Vatican has a great deal of the early jewelry. The

Metropolitan Museum in New York has a fair collection of the middle and later periods. But by far the greatest in number and variety of the objects found are the earthenware vases. There is one class essentially Etruscan, with its centre of manufacture at Chiusi (Clusium); it is the black ware with raised ornamentation called *bucchero nero*. There is the greatest and most fantastic variety in form and figured ornament in this class when compared to the sober and limited shapes of painted vases of the Greek class. The Etruscans had tried imitating Egyptian and Phœnician ware, but, with the importation of Corinthian painted vases in the seventh and sixth centuries and of Attic and other vases in the succeeding period, Greek mastery became supreme. The imitation is rarely perfect enough to deceive, but it is even closer than Phœnician imitations. One finds Etruscan echoes of all the Greek periods and schools of vase painting down to the third century, including imitation of the schools of southern Italy. In all their work the Etruscans seem to have followed simply commercial instincts and love of luxury. They had no artistic feeling. Whatever realism occasionally gives interest to their sculpture is due to the same regard for beliefs concerning the future life as are found in Egypt. The Etruscans held the pre-Hellenic attitude towards art as explanatory, decorative, and useful, not serving a higher purpose, or for its own sake as beautiful. Therefore they missed, in their imitations, the true spirit of Greek art. It is certain that Greek artists occasionally worked for and with them. Demaratus, the father of Tarquin, is said to have been a Greek artist from Corinth. Some of the paintings at Cære and Corneto must be by a Greek hand; also some of the terra-cotta temple sculptures. The artistic influence of Etruria upon Rome was paramount from the time of the Tarquins to the rise of Greek influence in the third century B.C. Even after that time it still lingers in the sarcophagus reliefs and statuary.

In two other branches the Etruscans produced imitative works of no higher order—scarabs, gems, and coins. The imitation of Egyptian and Phœnician cut gems began at an early date, but the material (paste, bone, etc.) was cheap and the workmanship poor. During the fifth century, however, archaic Greek gems were fairly well imitated, but after this period little was done. Coinage also, as in all central Italy, was late in reaching the artistic stage. The Greek silver standard (Attic standard of Solon) was adopted late in the sixth century, but the workmanship on the Etruscan coins remained inferior. See EARRING; ROMAN ART.

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ETRURIA, KINGDOM OF. A kingdom established in Italy by Napoleon I in 1801, formed out of the Province of Tuscany and assigned by him to the Bourbons of Parma. In 1808 it became a part of the French Empire, and in 1809 Napoleon's sister, Elise Bacciocchi, was made Grand Duchess of Tuscany. On the overthrow of Napoleon in 1814, Tuscany reverted to Ferdinand III, brother of Francis I of Austria.

ETRUS′CAN. See ETRURIA.

ETSCH, ĕtsh. See ADIGE.

ETTINGSHAUSEN, ĕt′tĭngs-hou′zen, KONSTANTIN, BARON VON (1826–97). An Austrian geologist and botanist. He was born and educated at Vienna and in 1854 was appointed professor of botany and of medical natural history at the Josephsakademie in Vienna, whence in 1871 he was called to Gratz. From 1878 to 1880 he was engaged by the British Museum in researches concerning its collection of fossil plants. To the study of nervation he devoted many of his principal works. Among them are: *Physiotypia Plantarum Austriacarum*, in collaboration with A. Pokorny (2 vols. of text and 10 vols. of copperplate illustrations, 1856–73); *Physiographie der Medizinalpflanzen* (with 294 imprints from nature, 1862); *Beiträge zur Erforschung der Phylogenie der Pflanzenarten* (7 books, 1877–80).

ETTLINGEN, ĕt′lĭng-en. A town of the Grand Duchy of Baden, Germany, on the Alb, about 4 miles south of Karlsruhe (Map: Germany, C 4). Its ancient wall and moat is still extant, but its only building of interest is the castle, built about 1730, on the site of an ancient Roman fortress. Educational institutions include a gymnasium and a Catholic teachers' seminary. It has manufactures of machinery, paper, cotton, shirtings, velvet, vinegar, and parchment. Pop., 1900, 8040; 1910, 9407. Ettlingen derives its origin from a Roman settlement. In 1227 it received municipal privileges and came into possession of the margraves of Baden. On July 9 and 10, 1796, it was the scene of the victory of the French under Moreau over Archduke Charles of Austria. The vicinity of Ettlingen is rich in Roman remains.

ETTMÜLLER, ĕt′mụl′lẽr, ERNST MORITZ LUDWIG (1802–77). A German philologist. He was born at Gersdorf, Saxony, studied at Leipzig from 1823 to 1826, and in 1830 began to lecture at Jena on the German poets of the Middle Ages. In 1833 he was called to the gymnasium at Zurich, and in 1863 to the university there, as professor of German literature. He edited the literary remains of the Middle High German and Old Low German dialects. In 1850 appeared, under his editorship, an Anglo-Saxon chrestomathy, *Engla and Seaxna Scôpas* *and Bôceras*, and in the following year his *Lexicon Anglo-Saxonicum*. He also gave his attention to the old Norse literature, as is shown by an edition of the *Vauluspá* (1830), translations, and a Norse reading book, and wrote. several original poems. His *Handbuch der deutschen Literaturgeschichte* (1847) includes treatments of the Anglo-Saxon, the old Scandinavian, and the Low German. Among his other works worthy of mention are: *Altnordischer Sagenschatz in neun Büchern übersetzt und erläutert* (1870); *Herbstabende und Winternächte, Gespräche über deutsche Dichtungen und Dichter* (3 vols., 1865–67); and his translation of *Beowulf* (1840).

ETTOR, Joseph J. (1886–). An American leader of the Industrial Workers of the World. He was a leader in labor disputes at Paterson, N. J., Brooklyn, N. Y., McKee's Rocks, Pa., and elsewhere; but he first attracted general attention by his capable leadership in the Lawrence (Mass.) textile mill strike in 1912, and by his subsequent nine months' imprisonment with Arturo M. Giovanitti (q.v.), when they were charged with responsibility for the death of a woman who was shot in a riot on Jan. 29, 1912. He was one of the leaders of the waiters' strike in 1913 and of the barbers' strike in 1914, both in New York City. He became a member of the executive council of the Industrial Workers of the World.

ET′TRICK. A valley in the south of Selkirkshire, Scotland, watered by the Ettrick River, which rises near Ettrick Pen, 2223 feet high (Map: Scotland, E 4). The river runs in a northeasterly direction for 32 miles and empties into the Tweed. Its chief affluent is the Yarrow, which runs 25 miles from the west through a beautiful and poetically celebrated vale. Ettrick Forest, a royal hunting tract, swarming with deer till the time of James V, included Selkirkshire and some tracts to the north. In Ettrick Vale, at Tushielaw, dwelt the celebrated freebooter or king of the border, Adam Scott, who was summarily executed by James V in 1530. James Hogg, the Scottish poet, known as "the Ettrick Shepherd," was a shepherd in this part of the country. Consult Craig-Brown, *History of Selkirkshire* (Edinburgh, 1886).

ETTRICK SHEPHERD, The. See Hogg, James.

"ET TU BRU′TE!" (Lat., And thou also, Brutus!). The words commonly believed to have been uttered by Julius Cæsar when struck by the hand of Brutus. There is, however, no ancient Latin authority for attributing them to Cæsar. The strong popular belief in their authenticity is a remarkable tribute to the genius of Shakespeare, who puts them into Cæsar's mouth at the moment of his fall (*Julius Cæsar*, III, i, 77). The words occur in other Elizabethan writers.

ETTWEIN, ĕt′vīn (1721–1802). A Moravian bishop. He was born of Waldensian ancestry at Freudenstadt, Württemberg, June 29, 1721, joined the Moravians in 1739, was ordained in 1746, came to America as a traveling evangelist and missionary to the Indians in 1754, and preached in 11 of the Colonies, traveling to the present State of Ohio, and to 12 Indian tribes. During 1776 and 1777 he was chaplain in the general hospital of the American forces at Bethlehem, Pa. Later he negotiated with Congress in behalf of the Christian Indians and represented the Moravians in dealings with the government. In 1784 he was consecrated a bishop, with charge of the Moravian churches in America; in 1787 he founded the Society of the United Brethren for Propagating the Gospel among the Heathen, which is still active. He prepared a dictionary and phrase book of the language of the Delaware Indians and published an account of their customs, traditions, etc. He died at Bethlehem, Pa., Jan. 2, 1802.

ET′TY, William (1787–1849). An English figure and historical painter. He was born at York, March 10, 1787. In accordance with the wishes of his father he served seven years of apprenticeship to a printer of Hull. He was, however, enabled to prosecute his studies in painting through the generosity of his uncle, William Etty, who in 1806 invited him to London. In 1807 he entered the Royal Academy School, studying under Fuseli, and he also studied privately for a year under Sir Thomas Lawrence, whose influence for some time dominated his art. He copied a great deal from the old masters in the National Gallery and was a constant student in the Life School of the Academy, even after he had become an Academician. He paid a brief visit to Paris and Florence in 1816, and in 1822 he took a longer journey to Italy, spending most of his time in Venice. From his studies of the Venetian masters he acquired that excellence in color for which his works are chiefly known. On his return to England, in 1824, his "Pandora Crowned by the Seasons" was much applauded, and he was made a member of the Royal Academy in 1828. From this time he was very successful and amassed a good competence. He resided in London until 1848, but on account of failing health he retired to York, where he died Nov. 13, 1849.

Etty painted very unequally. His work at its best possesses great charm of color, especially in the glowing, but thoroughly realistic, flesh tints. The composition is good, but his drawing is sometimes faulty, and his work usually lacks life and originality. He often endeavored to inculcate moral lessons by his pictures. He himself considered his best works to be "The Combat," the three "Judith" pictures, "Beniah, David's Chief Captain" (all in the National Gallery of Scotland, Edinburgh), "Ulysses and the Sirens" (Manchester Gallery), and the three pictures of "Joan of Arc." He is also represented in the South Kensington Museum, at Glasgow and in English provincial museums, and in the Metropolitan Museum, New York, by "The Three Graces," considered by many his masterpiece.

Consult: his "Autobiography," in *Art Journal* (London, 1849); Gilchrist, *Life of W. Etty* (ib., 1855); Cosmo Monkhouse, "Etty," *Dictionary of National Biography* (ib., 1889).

ÉTUDE, ā′tụd′ (Fr., a study). Originally a composition for some instrument written for the purpose of developing technical skill. The name was first used by J. B. Cramer in his op. 50, the famous 84 studies for pianoforte, published in 1810. Each study is built upon a single theme and designed to develop some particular point, such as staccato, arpeggio, trill, etc. Soon various composers recognized the possibilities of this simple form and began to write studies for concert performance. These contained not only an accumulation of technical difficulties, but frequently themes of rare beauty and power. Such are the famous études of Liszt (*Etudes* *d'exécution transcendante*), Schumann's *Études symphoniques*, and Chopin's *Études*, op. 10 and 25, all of which are in the concert repertoires of the greatest pianists and rank among the greatest compositions for pianoforte. Of similar works for the violin may be mentioned the études of Kreutzer, Fiorillo, and Paganini. Some of the more extended études introduce also a second theme. See CHOPIN.

ETYMOLOGICUM GUDIANUM. See ETYMOLOGICUM MAGNUM.

ET'YMOLOG'ICUM MAG'NUM (Lat., great etymological work). The name commonly given to a Greek lexicon which dates from the early part of the tenth century A.D. The compiler is unknown, but the work was based on a similar work of the ninth century, which should properly bear the title, and another lexicon similar to the extant *Etymologicum Gudianum*. The ninth-century etymologicum no longer exists uncontaminated by later additions, but it is clear that it preserved in purest form the basis of the numerous Byzantine etymologica which have been transmitted to us. These all profess to give the etymologies of the words contained in them—hence the name. In spite of the fanciful derivations they often contain much valuable material, particularly from earlier writers. On the whole subject, consult Reitzenstein, *Geschichte der griechischen Etymologika* (Leipzig, 1897), and Cohn, "Griechische Lexicographie," pp. 702, 703, of Brugmann-Thumb, *Griechische Grammatik* (4th ed., Munich, 1913). The best edition of the *Etymologicum Magnum* is by Gaisford (Oxford, 1848). The *Etymologicum Gudianum* and others are edited by Sturz (Leipzig, 1816-20). See DICTIONARY.

ET'YMOL'OGY (Lat. *etymologia*, from Gk. *ἐτυμολογία*, from *ἔτυμος*, *etymos*, true + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). That branch of philology (q.v.) which deals with the derivation of words and with their comparison in different members of the same language group. In its relation to the other great subdivisions of linguistic science, phonology, morphology, and syntax, etymology stands in closest association with phonology. Without rigid scientific adherence to phonetic law (q.v.) there can be no real etymology. On the other hand, phonology in its nonphysiological aspect is based on etymology. The earliest of all the branches of linguistics to attract attention was etymology. The word was first used as a philosophical, not as a linguistic term. The Greek Stoics, in their disputations with the Skeptics, asserted that language existed by nature, not by convention. Words were therefore real (Gk. *ἔτυμος*), and it was the task of etymology, according to the Stoic view, to prove this reality. It is, however, noteworthy that long before the foundation of the Stoic school, Plato (q.v.) made an approximation to the modern method in his *Cratylus*. Not only does he there set forth for the first time the elemental divisions of Greek phonology, but he intentionally etymologizes. Thus he correctly connects *γυνή*, woman, with *γονή*, *seed*, and going a step further declares that the words for fire (*πῦρ*), water (*ὕδωρ*), and dog (*κύων*) are almost the same in Greek as in Phrygian, which we now know to be related to the Armenian (cf. Armenian *hur*, fire, *get*, water, *šun*, dog). Independently of Greece, India developed a study of language far more exact and thorough than any other ancient people ever did. As in Greece etymology had sprung from philosophy, in India it had its basis in religion. The first formal treatise on etymology in Sanskrit is Yaska's Nirukta (literally, outspoken), which dates perhaps from as far back as the fifth century B.C. The Nirukta, which ranks as one of the six Vedangas, or members of the Veda, was composed to explain hard words in the Rigveda. The stress laid upon the source and meaning of the words, both in India and in Greece, is highly significant of the practical value of etymology. It is safe to affirm that without etymology there can be no exact orthoëpy. Exactness in the use of words is in direct proportion to the exactness of knowledge of their meaning, and exactness of knowledge of their meaning is in its turn in large measure conditioned by exactness of knowledge of their origin. Again, the attempt to etymologize is found in the earliest literary records. The Indian Yajur Veda (q.v.) abounds in these primitive etymologies, many of which are extremely naïve and erroneous (as the story that the deity Prajapati swelled up, *aśvayat*, and from this swelling *śvayatha*, came the horse, *aśva*), while others are still deemed correct (as when by day, *divā*, Prajapati created the gods, *dēvās*, "for that is their godhead," *dēvatvam*). In the Bible *Eve* (Hebrew *Ḥawwa*, Gen. iii. 20) is popularly derived from *ḥāwā*, to be, and in Gen. ii. 23, *ishsha*, woman, is explained as a derivative of *ish*, man. This primitive kind of etymology is still common and is known as popular, or better as folk, etymology. It is sometimes right and more frequently wrong. Often among those who are unacquainted with the history of words, there will be found attempts to etymologize them as being related to others to which they may have some phonetic or, less commonly, some graphic resemblance. Examples of this are exceedingly numerous. Thus, German *Wahnwitz*, frenzy, is popularly associated with *wähnen*, to think, especially to think incorrectly, whereas it really signifies, as the Old High German form *wanawizzi* shows, witlessness, the first component being *wana*, without. Another instance is German *Sündflut*, deluge, connected popularly with *sünden*, to sin, but really derived from *sinvluot*, great flood. In English we have words like *bridegroom* (shortened also into *groom*), really bride's man (Anglo-Saxon *brydguma*), associated with *groom*; *island*, properly isle-land (Anglo-Saxon *ēg-lond*), which has been explained as land like an eye in the waters; *crayfish* (French *écrevisse*, crab), which is supposed to be a sort of fish, or *asparagus* (Greek *ἀσπάραγος*), which becomes *sparrow grass* in rustic speech. Abortive as many of the popular etymologies are, they are none the less important as indicating the universal need, felt by such as employ language, for some sort of explanation of the meaning of the words they use.

With the discovery of the importance of Sanskrit (q.v.) in linguistic investigation, and the rise of the science of comparative linguistics (see PHILOLOGY), etymology was placed on a scientific foundation. Its history is connected inseparably with the branch of learning of which it forms a part, but its method may be briefly outlined. First and foremost there must be a strict adherence in all etymological investigation to the principles of phonetic law (q.v.). The etymology which fails to conform to these laws must receive overwhelming confirmation from other quarters before it can be regarded as even possible. In the case of loan words phonetic law is apparently violated, and it will frequently happen that a language will have two or more words derived from a single word, one being the regular phonetic development and the other a borrowed form. In this case the latter form, known by the French term *mot savant*, is usually differentiated in meaning from the former. Thus, we have in French and English such words as *royal* and *regal*, both from the Latin *regalis*, kingly; the form *regal* being borrowed directly from the Latin, while *royal* (cf. French *roi*, king, from the Latin accusative *regem*) is the phonetically correct form. Loan words may also undergo the regular sound changes of the language into which they have been adopted. Thus, Latin *pondus*, pound, appears in Gothic and Anglo-Saxon as *pund*, with unchanged consonants, but in Old High German it is subject to the action of Grimm's law (q.v.) and becomes *phunt*. It is therefore evident that in etymology attention must be paid to the history of words and sometimes to the records of the tribes speaking them. Thus, the English *wise* is akin to the Gothic *unweis*, unwise, Old High German *wis*, New High German *weise;* but *wise* is also a doublet of *guise*, which is the form assumed by *wis* in the Romance languages, which borrowed the word from the Germanic form. If it is true that the same word may assume different forms in the same language, it is equally true that different words may become identical in form in a given language. The large class of homonyms in every language is sufficient proof of this. An excellent English example of this phenomenon is *sound*, which is a conglomerate of four originally distinct words—viz., Anglo-Saxon *gesund*, hearty, Anglo-Saxon *sund*, a body of water, Latin *sonus*, noise, and Latin *subundare*, to dive beneath the waves. It is probable that many instances in which a word shows extraordinary diversity of meanings are to be traced to this process of conglomeration rather than to semasiological developments. (See SEMASIOLOGY.) It is, however, in the tracing of words back through an entire group of cognate languages to a hypothetical original form, denoted conventionally by an asterisk (*), that etymology finds its principal application. The older etymologists made wild guesses in their primitive investigations, and such etymologies are still made by untrained minds. Thus, Latin *deus*, god, Old Latin *deivos*, akin to Sanskrit *dēva*, god, has been connected with the English *devil*, from Greek *διάβολος*, slanderer, and English *god*, in addition to the old stock comparison with *good*, with which the word has no etymological relation, has been equated with Sanskrit *gūḍha*, hidden. It is true that many etymologies which are perfectly sound seem at first sight impossible to those who are not acquainted with phonetic laws and the principles of word formation. It is also true that many etymologies which are very plausible to students of comparative linguistics are in reality doubtful and accepted only provisionally. Such etymologies may ultimately be discarded, just as the provisional assumptions often accepted by investigators in the exact sciences are discarded, if further research shows them to be false.

Etymology may be confined to a specific group of languages or dialects. We may thus speak of Romance etymology, where words in the Romance languages are traced back for the most part to folk-Latin originals (as French *même*, self, Old French *meisme*, Provençal *medesme*, Spanish *mismo*, Italian *medesimo*, from folk Latin *met* + **ipsimus*), Germanic, Celtic, Indo-Iranian etymology, and the like. All these are combined in Indo-Germanic etymology. Similarly we may have Semitic, Dravidian, Uralo-Altaic, or Polynesian etymologies, but Indo-Germanic is the most thoroughly systematized of all and serves as a model for the rest. It must be borne in mind, however, that accidental resemblance of sound is no proof of etymological kinship. It is, consequently, unscientific to compare, as some have done, Semitic or Dravidian with Indo-Germanic words. The fact, e.g., that Latin *taurus* sounds like Arabic *thaur*, both meaning bull, or English *sheriff* (Anglo-Saxon *scīr-gerēfa*, shire-reeve) resembles in sound the Arabic *sharīf*, exalted, also used of an official of a city, implies no relationship. Within a language group the same statement holds true. Sanskrit *sūpa*, broth, has no connection with English *soup*, nor are the English verbs *drag* and *draw* akin. As an example of etymological procedure, we may take the word for ten in the Indo-Germanic languages. Thus, we have English *ten*, Anglo-Saxon *tyn*, Old Saxon *tehan*, Icelandic *tíu*, Gothic *taíhun*, Old High German *zehan*, New High German *zehn*, Old Irish *deich*, Irish *déag*, Gaelic *deug*, Cornish and Welsh *dec*, Breton *dec*, Latin *decem* (whence the Romance group, Italian *dieci*, Spanish *diez*, Old French *dis*, French *dix*, etc.), Umbrian *desen-duf* for **deçem-duf*, twelve (ten-two), Greek *δέκα*, Old Church Slavic *desętĭ*, Czech *desátý*, Polish *dziesiąty*, Russian *désyatĭ*, Lithuanian *dẽszimtis*, Lettish *desmit*, Old Prussian *dessīmts*, Armenian *tasn*, Albanian *δjete*, Avesta, *dasa*, New Persian *dah*, Afghan *las*, Shighni *δïs*, *lis*, Sanskrit *daśan*, Prakrit, Pali, *dasa*, Hindi *das*, Marathi *dahā*. A comparison of all these forms, and more which might be added to the list, results in the postulation of a pre-Indo-Germanic form **deḱm̥*, to which, in accordance with the sound laws governing the various divisions of the Indo-Germanic languages, and with reference to the principles of word formation (as in the *-ti-* formation in Old Church Slavic, Czech, Polish, Russian, Lithuanian, Lettish, and Old Prussian in the example quoted), the various forms of the numeral ten are referred as to a convenient formula. (See PHILOLOGY.) The scope of etymology has been immensely widened by the theories of root determinatives and root extensions, and by the doctrine of the dissyllabic base or root (see PHILOLOGY), which have rendered possible the explanation of many words whose derivation had before been unknown.

Consult: Pott, *Etymologische Forschungen auf dem Gebiete der indogermanischen Sprachen* (Detmold, 1859–74); Fick, *Vergleichendes Wörterbuch der indogermanischen Sprachen* (Göttingen, 1890–94), especially Falk and Torp, *Wortschatz der Germanischen Spracheinheit* (ib., 1909), which forms the third part of the preceding work; Paul, *Prinzipien der Sprachgeschichte* (4th ed., Halle, 1909); Finck, *Die Haupttypen des Sprachbaus* (Leipzig, 1910); Schrader, *Sprachvergleichung und Urgeschichte* (3d ed., 2 vols., Jena, 1906–08); Gray, *Indo-Iranian Phonology* (New York, 1902); Uhlenbeck, *Kurzgefasstes etymologisches Wörterbuch der altindischen Sprachen* (Amsterdam, 1898–99); Leumann, *Etymologisches Wörterbuch der Sanskrit-Sprache* (Leipzig, 1907); Monier-Williams, *Sanskrit-English Dictionary* (Oxford,

1899); Thumb, *Handbuch des Sanskrit mit Texten und Glossar* (Heidelberg, 1905); Bartholomæ, *Altiranisches Wörterbuch* (Strassburg, 1904); *Zum altiranischen Wörterbuch, nacharbeiten und vorarbeiten* (ib., 1906); Hübschmann, *Etymologie und Lautlehre der ossetischen Sprache* (ib., 1887); Horn, *Grundriss der neupersischen Etymologie* (ib., 1893); Meyer, *Etymologisches Wörterbuch der albanesischen Sprache* (ib., 1891); Weigand, *Albanesische Grammatik im südgegischen Dialekt* (Leipzig, 1913); Hübschmann, *Armenische Grammatik*, vol. i (ib., 1895); Curtius, *Grundzüge der griechischen Etymologie* (5th ed., ib., 1879); Prellwitz, *Etymologisches Wörterbuch der griechischen Sprache* (2d ed., Göttingen, 1905); Meyer, *Handbuch der griechischen Etymologie* (Leipzig, 1901 et seq.); Edwards, *English-Greek Lexicon* (Cambridge, 1912); Boissaq, *Dictionnaire étymologique de la langue grecque* (Heidelberg, 1907–13); Solmsen, *Beiträge zur griechischen Wortforschung* (Strassburg, 1909–); Vaniček, *Etymologisches Wörterbuch der lateinischen Sprache* (2d ed., Leipzig, 1881); Bréal and Bailly, *Dictionnaire étymologique latin* (Paris, 1885); Walde, *Lateinisches etymologisches Wörterbuch* (2d ed., Heidelberg, 1910); Thomas, *Studien zur lateinischen und griechischen Sprachgeschichte* (Berlin, 1912); Miklosich, *Etymologisches Wörterbuch der slavischen Sprachen* (Vienna, 1886); Berneker, *Slavisches etymologisches Wörterbuch* (Heidelberg, 1908); Vondrak, *Vergleichende slavische Grammatik* (2 vols., Göttingen, 1906–08); Uhlenbeck, *Kurzgefasstes etymologisches Wörterbuch der gotischen Sprache* (2d ed., Amsterdam, 1900); Kluge, *Etymologisches Wörterbuch der deutschen Sprache* (7th ed., Strassburg, 1910); Hirt, *Etymologie der neuhochdeutschen Sprache* (Munich, 1909); Franck, *Etymologische woordenboek der nederlandsche taal* (The Hague, 1884–92); Tamm, *Etymologisk svensk ordbok* (Stockholm, 1891); Dietz, *Etymologisches Wörterbuch der romanischen Sprachen* (2d ed., Bonn, 1861–62); Körting, *Lateinisch-romanisches Wörterbuch* (3d ed., Paderborn, 1907); Meyer-Lübke, *Romanisches etymologisches Wörterbuch* (Heidelberg, 1911); Coelho, *Diccionario manuál etymológico da lingua portugesa* (Lisbon, 1890); Brachet, *Dictionnaire étymologique de la langue française* (2d ed., Paris, n.d.); Scheler, *Dictionnaire d'étymologie française* (ib., 1880); Körting, *Etymologisches Wörterbuch der französischen Sprache* (Paderborn, 1908); Stappers, *Dictionnaire synoptique de la langue française, donnant la dérivation des mots usuels* (Paris, 1911); Clédat, *Dictionnaire étymologique de la langue française* (ib., 1912); Schwan-Behrens, *Grammaire de l'ancien français* (2d Fr. ed., Leipzig, 1913); Pianigiani, *Vocabolario etimologico della lingua italiana* (Milan, 1907); Wiese, *Altitalienisches Elementarbuch* (Heidelberg, 1904); Calandrelli, *Diccionario filológico-comparado de la lengua castellana* (8 vols., Buenos Aires, 1880–1910); Hanssen, *Gramática histórica de la lengua castellana* (Halle, 1913); Müller, *Etymologisches Wörterbuch der englischen Sprache* (2d ed., 2 vols., Cöthen, 1878); Skeat, *Principles of English Etymology* (2 vols., Oxford, 1887-91); *Etymological Dictionary of the English Language* (new ed., ib., 1910); Bülbing, *Altenglisches Elementarbuch* (Heidelberg, 1902); Bradley, *The Making of English* (London, 1904); Skeat, *The Science of Etymology* (Oxford, 1912); Kaluza, *Historische Grammatik der englischen Sprache* (2d ed., 2 vols., Berlin, 1906–07); J. and E. M. Wright, *Old English Grammar* (London, 1908); Palmer, *Folk-Etymology* (ib., 1882); Osthoff, *Etymologische Parerga* (Leipzig, 1901); Henry, *Lexique etymologique du breton moderne* (Rennes, 1900); Pedersen, *Vergleichende Grammatik der keltischen Sprachen* (2 vols., Göttingen, 1900–13).

ETYMOLOGY, Figures of. Terms employed in etymological discussions. They must be carefully distinguished from the figures of rhetoric or speech, of prosody, and of syntax, although there are instances in which the different classes overlap. The most important figures of etymology are as follows: Ablaut or vowel gradation is the term given to such quantitative, qualitative, or accentual differences of the sonantal element of a root- or suffix-syllable, as were not called forth by sound-laws which were in operation at the time of the individual development of the Indo-Germanic languages, but had their origin either directly or indirectly in primitive Indo-Germanic differences. Every such syllable, whether a root or a suffix, may successively exhibit three main grades of vocalism which are denoted by the terms (1) "normal," (2) "weak" or "reduced," and (3) "deflected grade." Thus if the primitive syllable contains an *ĕ*, it is kept intact in the first grade; in the second, the *ĕ* vanishes entirely; and in the third, it is replaced by an *ŏ*. Thus from the Indo-Germanic root *pĕt-*, 'to fall or fly,' we have the Greek *πέτεσθαι*, 'to fly' in the present; if reduced, we have *πτ-έσθαι* in the aorist of the same verb; lastly, if deflected, we have, *ποτ-άομαι*, 'I flutter.' So also Gk. *φέρω*, (*δί-*)*φρ-ος* and *φόρ-ος*; Gothic *auhs-in*, *auhs-n-ē*, and *aúhs-an-s*, where the ablaut appears in the suffix. Aphæresis (Gk. *ἀφαίρεσις*, a taking away) is the loss of the initial letter or syllable of a word, as Sanskrit *stha*, 'ye are,' but Greek *ἐστέ*, Latin *estis;* Sanskrit *kuddāla*, hoe, but Singhalese *udalu;* English *'low* for *allow*. Apocope (Gk. *ἀποκοπή*, a cutting off) is the same process at end of a word, as Greek *πάρ*, 'beside,' beside *παρά* (cf. Sanskrit *par*); Latin *fac*, *'do,'* beside *face;* French *bel*, 'beautiful,' but Latin *bellum;* Old High German *hirti*, 'shepherd,' but German *Hirt;* Avesta *raoγna*, 'oil,' but Kashani Persian *rō*, beside *ruγan*. This phenomenon is due in almost every case to the weakening and ultimate disappearance of the final vowel or syllable on account of the stress-accent in the preceding part of the word. Assimilation (Lat. *assimilatio*, similarity) is the change undergone by sounds to make them harmonize with other sounds in the same word, and it may be either regressive, assimilating the second sound to the first, as Greek *κλυτύτατος*, 'sweetest,' beside *γλυκύτατος*, Latin *quinque*, 'five,' but Greek *πέντε*; or progressive, assimilating the first sound to the second, as Greek *Θέθις*, name of a sea-goddess, beside *Θέτις*; Old Church Slavic *mraviya*, 'ant,' but Greek *μύρμηξ*. By compensatory lengthening is meant the lengthening of a vowel of a syllable due to the loss of a following consonant, as Greek *πᾶσα* for *πάνσα*; *ἔχουσι* for *ἔχοντι*; Latin *equōs* for earlier **equŏns; totiēs* for *totiens;* French *pâte* for Latin *pasta*. Contamination (Lat. *contaminatio*, defilement) is a composite but not compound word, influenced by different words, as German *heischen*, 'to demand,' which is a contamination of Old High German *eiscōn*, 'to demand,' and *heizzan* (German *heissen*), 'to call.' It is sometimes difficult to draw the line between contamination and the far more frequent phenomenon of analogy (q.v.). Contraction (Lat. *contractio*, a drawing together) is the coalescence of two or more vowels into one, as Greek *τιμῶμεν*, 'we honor,' for **τιμάομεν*; *τιμῷμι*, 'I should honor,' for **τιμάοιμι*; Latin *copia*, 'abundance,' for **co-opia*. Crasis (Gk. *κρᾶσις*, mixture) is the combination of two vowels into one, this change being in most cases only an artificial subdivision of vowel contraction, as Greek *φροῦδος*, 'vanished,' for *πρὸ ὁδοῦ*; Latin *cunctus*, 'all,' for **coiunctus*. Dissimilation (from Lat. *dissimilis*, unlike) is the reverse of assimilation, treated above, and is therefore the change undergone by sounds to make them different from other sounds in the same word, either regressively, as Greek *θηλητήρ*, 'hunter,' beside *θηρητήρ*; Italian *veleno*, 'poison,' beside *veneno;* or progressively, as Latin *fraglo*, 'I burn,' beside *fragro;* Old High German *turtultûba*, English *turtle-dove*, but Latin *turtur;* dialectic Italian *lumero*, 'I count,' beside *numero*. Dissimilation often involves loss of sounds, as Latin *mamor*, 'marble,' beside *marmor;* Spanish *cribo*, 'sieve,' but Latin *cribrum;* Sanskrit *tisṭhati*, 'he stands,' but Avesta *hištaiti*, Latin *sistit;* Latin *spondeo*, 'I pledge,' but perfect *spopondi*. This tendency forms the basis of Grassmann's law (q.v.). Epanthesis (Gk. *ἐπένθεσις*, insertion), or, more scientifically, anaptyxis (Gk. *ἀνάπτυξις*, unfolding), is the insertion of a letter or syllable, as Latin *drachuma*, from Greek *δράχμη*, 'drachma,' *μεσημβρία*, *midday*, for **μεσημ(ε)ρία*; English *umberella* for *umbrella*. Gemination (Lat. *geminatio*, a doubling) is a doubling of consonants, as Greek *ἰσχυρρός*, 'strong,' beside *ἰσχυρός*; Latin *cuppa*, 'tub,' beside *cupa;* German *Himmel*, 'heaven,' beside Middle High German *himel*. It is normally accompanied by the shortening of a preceding long vowel. Haplology (from Gk. *ἀπλόος*, simple, and *λόγος*, word) or haplolaly (from Gk. *ἀπλόος*, simple, and *λαλία*, speech) is the suppression of one of two homophonous syllables in a word, as Greek *ἀμφορεύς*, 'pitcher,' for **ἀμφιφορεύς*; Latin *semodius*, 'half-peck,' for **semimodius;* English *dynometer*, beside *dynamometer*. Hiatus (Lat., gap) is the juxtaposition of two or more vowels without contraction, as Greek *προάγω*, 'I lead forth'; Latin *ea*, 'she,' Gothic *aíáuk*, 'I increased,' from *aukan*. Metathesis (Gk. *μετάθεσις*, transposition) is the transposition of letters in a word, one of the most frequent of all the figures of etymology, as Greek *κάρτος*, 'strength,' beside *κράτος*; *χιτών*, 'tunic,' beside *κιθών*; Latin *sterno*, 'I strew,' beside the perfect *stravi; lerigio*, 'religion,' beside *religio; coacla*, 'sewer,' beside *cloaca;* Italian *crapa*, 'goat,' beside *capra; grolia*, 'glory,' beside *gloria*. As will be seen from the examples quoted, metathesis affects especially the liquids *r* and *l*, but we also have such changes as Sanskrit *sakaṭa*, 'stupid,' Pali *kasaṭa;* Sanskrit *śayana*, 'bed,' Singhalese *yahana*. Paragoge (Gk. *παραγωγή*, addition) is the addition of one or more inorganic letters to the end of a word. In Greek the so-called 'nu movable' (Greek *νῦ ἐφελκυστικόν*), which is added especially to words ending in *-σι*, and to verbs with the third person in *-ε* before vowels (as *πᾶσι δίδωσι ταῦτα*, 'he gives these to all,' but *πᾶσιν ἔδωκεν ἐκεῖνα*, 'he gave those to all'), perhaps may be placed here superficially. An English example is the paragogic *r* in such words as *law-r*. This phenomenon is usually caused by the desire to avoid a hiatus, but is often etymologically justified, as in the case of the French *a-t-il*, 'has he?' beside *il a*, 'he has' (folk Latin *habet-ille*, beside *ille habet*). Prothesis (Gk. *πρόθεσις*, a placing before) is the prefixing of an inorganic sound to a word, as Greek *ἐρυθρός*, 'red,' but Latin *ruber;* Armenian *erek*, 'evening,' but Sanskrit *rajas;* Sanskrit *ulōka*, 'world,' beside *lōka;* Avesta *aēšma*, 'wrath,' but Persian *xišm;* Latin *status*, state, but Spanish *estado*, Old French *estat*, French *état;* Cockney English *Hi* for *I*. Simplification (from Lat. *simplex*, simple, and *facere*, to make) is the reverse of gemination, treated above, and consists in the substitution of a single consonant for a repeated or double one, as Greek *μέσος*, 'middle,' beside *μέσσος*; Latin *vacilo*, 'I waver,' beside *vacillo;* Old High German *doufene*, 'to dip,' beside *doufenne*. Syncope (Gk. *συγκοπή*, abbreviation) is the omission of a letter or syllable from the interior of a word, as Greek *πατρός*, 'of a father,' beside *πατέρος*; Latin *præbeo*, 'I offer,' for **præhibeo*, **præhabeo;* Provençal *anma*, 'soul,' from Latin *anima;* Sanskrit *la śuna*, 'onion,' but Singhalese *lūnu;* Anglo-Saxon *nolde*, 'would not,' for **ne wolde* (cf. English *nilly-willy*); English *wondrous* beside *wonderous*. Syncretism is the tendency towards a reduction of the number of case or tense forms. Thus the Indo-Germanic Locative, Instrumental, and Ablative cases have become united into the Ablative Case in Latin; the relations expressed by the same cases in Indo-Germanic, including the Dative, have become confused into the Dative in the early Germanic. Tmesis (Gk. *τμῆσις*, division) is the separation of the parts of a word, especially a compound, by another word. This is properly only an apparent figure. It had its origin in verbs compounded with prepositions, and as prepositions are originally stereotyped case-forms of nouns used adverbially (see PREPOSITIONS), the union was at first only a very loose one, as in English *overbear* beside *bear over*. As examples may be cited Greek *ἐπὶ κνέφας ἦλθεν*, 'darkness came on,' for *κνέφας ἐπῆλθεν*; Latin *sub vos placo*, 'I implore you,' for *supplico vos;* and such a monstrosity as *cere-comminuit-brum*, 'he dashed out his brains,' for *cerebrum comminuit*. In German this tmesis is subject to regular laws, as *er führte seinen Entschluss aus*, 'he carried out his resolution,' but *ich sagte, dass er seinen Entschluss ausführte*, 'I said that he carried out his resolution.' Finally, Umlaut or Metaphony, taking place principally in English and German, indicates the mutations undergone by a vowel, *a*, *e*, *o*, *u*, when immediately followed by a syllable which contains an *i*, or the semivowel *j*, under the influence of which it acquired a slight *i*- sound, and altered accordingly. Thus German *mann* but *männlich; erde*, *irdisch; buch*, *bücher;* English *man*, *men; brother*, *brethren; goose*, *geese; foot*, *feet*. As the antiquity of the terms implies, the majority of the figures of etymology were known to the classical grammarians, although the full explanation of them has been rendered possible only by the development of comparative linguistics (see PHILOLOGY), especially of that branch of it which deals with etymology (q.v.).

ETZEL, ĕt′sel. See ATTILA.

EU, ē (ML. *Auga*, *Augium*). A town in the Department of Seine-Inférieure, France, near the mouth of the Bresle, 93 miles north-northwest of Paris (Map: France, N., G 2). It is remarkable for the fine twelfth-century Gothic church of Saint-Laurent and for the Château d'Eu, a low seventeenth-century building of red brick, with high, tent-shaped roofs of slate. Louis Philippe expended large sums on the embellishment of the château, its magnificent park and unique portrait gallery. A large part of the château was destroyed by fire in 1902. The harbor of Eu connects through its own canal with the sea harbor of Le Tréport. Eu manufactures furniture, leather, sail cloth, ropes, soap, lace, and silk. Pop. (commune), 1901, 5398; 1911, 5651.

EU, PRINCE LOUIS PHILIPPE MARIE FERDINAND GASTON D'ORLÉANS, COMTE D' (1842–1922). A Brazilian soldier. He was born in France, the eldest son of the Duc de Nemours and the grandson of Louis Philippe. In 1864 he was married to Isabel, heiress apparent to the throne of Brazil. He was a marshal in the Brazilian army and was commander in chief of the allied forces in the war with Paraguay, which he brought to a successful termination in 1870. During Emperor Dom Pedro's long visits to Europe the Comte d'Eu had the direction of Brazilian affairs, but he became very unpopular, owing to his ultraclerical views, and, after the proclamation of the Republic in 1889, retired to France.

EUA, ā-ōō′ȧ, or **EOA.** One of the Tonga (q.v.) or Friendly Islands, about 10 miles southeast of Tongatabu, in lat. 21° 25′ S., and long. 174° 50′ W. It is about 10½ miles long by 3 miles wide. Its surface is rugged; the highest elevation reaches an altitude of 1078 feet. Area, 67 square miles. Pop., 350.

EUAN′THIUS. A Roman grammarian, who died at Constantinople in 358 A.D. He wrote a commentary on Terence which Donatus used in his own commentary on Terence. Euanthius' treatise *De Fabula* appears, apparently in full, in Donatus' work. Consult Wessner, *Æli Donati . . . Commentum Terenti*, vol. i (Leipzig, 1902).

EUBŒ′A, *MGk. pron.* ĕv′vĭ-ȧ (Lat., from Gk. Εὔβοια, *Euboia*, rich in cattle, from εὖ, *eu*, well + βοῦς, *bous*, ox, cow; unofficial modern Gk. and Turk. *Egripo;* It. *Negroponte*). A long, narrow island of Greece, stretching along the northeast coast of Locris, Bœotia, and Attica, from which it is separated by a narrow channel. The northwestern part of this is the Channel of Atalante (the Eubœan Sea of the ancients), at one point less than 2 miles in width. At Chalcis the island is separated from the mainland by a very narrow strait, called the Euripus, but a few rods in breadth. At the north the Channel of Trikeri separates Eubœa from Thessaly, of whose eastern mountains, Ossa and Pelion, the Eubœan Range is a continuation. The extreme length of the island is about 100 miles; its breadth varies from 30 miles to about 4. Its area is 1438 square miles. The island is intersected by a chain of mountains running northwest and southeast, and attaining in the centre, in the range of Mount Delphi (Gk. Δέλφη, ancient Δίφρυς), an elevation of about 5725 feet. In ancient times copper and iron were mined in the island, and Carystus was the source for the green and white Cipollino marble, much used in ancient Rome. The mountains are still well wooded, and in the north are hot sulphur springs, much sought in ancient and modern times for their medicinal qualities. There is an abundance of good pasturage, and the valleys on the west coast are fertile, especially the famous Lelantian Plain, between Chalcis and Eretria; for this plain the two cities long fought. The chief products are oil, wheat, fruit, and honey. The inhabitants are chiefly engaged in cattle breeding; they export wool, hides, cheese, oil, and grain. The chief towns are Chalcis (q.v.) on the Euripus and Carystus on the south coast. Greek tradition told of Abantes and Dryopes, immigrants from the mainland of Greece, as the earliest inhabitants. Later Ionians from Attica founded the ancient cities of Chalcis and Eretria, which sent colonies to Italy, Sicily (see CUMÆ; NAXOS; REGGIO DE CALABRIA: this town was founded from Cumæ, via MESSINA), and especially to Chalcidice, on the coast of Thrace. (See also ARTEMISIUM.) In 506 B.C. Chalcis was conquered by the Athenians, and after the Persian wars the whole island came under their control. (For Eubœa and the Persian Wars, see ERETRIA; GREECE, *History*, Ancient History.) After the Peloponesian War Eubœa became independent and was the scene of intrigues and fighting between the Athenian, Theban, and Macedonian parties, until the battle of Chæronea (338 B.C.) brought it under the power of Macedon. Under the Romans it had a nominal independence from 194 to 146 B.C., when it became part of the Province of Macedonia. The conquest of Constantinople by the Crusaders in 1204 A.D. brought the seaports under the rule of the Venetians, who after many petty wars became masters of the whole island in 1366; during Venetian rule the island was highly prosperous. It was taken by the Turks in 1470 and remained in their possession until the Greek Revolution. In 1830 it was made part of the new Greek state, of which it now forms, with some minor islands, a nomarchy. Area of nomarchy, 1621 square miles; pop. (1907), 116,903. Consult: Baumeister, *Topographische Skizze der Insel Euboia* (Lübeck, 1864); Bursian, *Geographie von Griechenland*, vol. ii (Leipzig, 1873); Geyer, *Typographie und Geschichte der Insel Euboia* (Berlin, 1903); Baedeker's *Handbook of Greece* (4th Eng. ed., Leipzig, 1909).

EUBULIDES, ū-bŭl′ĭ-dēz (Lat., from Gk. Εὐβουλίδης, *Euboulidēs*), OF MILETUS. A Greek philosopher of the Megarian school in the fourth century B.C. He is credited with the invention of several of the most false and captious syllogisms of his school. He was an opponent of Aristotle, whose writings he repeatedly censured, and whose character he calumniated. Demosthenes is said to have studied dialectics under him. See MEGARA; EUCLID OF MEGARA.

EUBU′LIUS. See METHODIUS.

EUBU′LUS (Lat., from Gk. Εὔβουλος, *Euboulos*). An Athenian orator and statesman, contemporary and opponent of Demosthenes. He was of the peace party in Athens and became administrator of the city finances. He was succeeded in this office by Lycurgus. Eubulus was the friend of Æschines (q.v.) and was concerned in all the events of interest during the middle of the fourth century. At first he opposed the Macedonians, but later, won over by Philip, he became a warm supporter of the Macedonian cause. Consult: Beloch, *Griechische Geschichte*, vol. ii (Strassburg, 1897); Goodwin's edition of Demosthenes' *De Corona* (Cambridge, 1901); Francotte, *Les finances des cités grecques* (Liége, 1910).

EUBULUS. A Greek poet of the Middle Comedy, who flourished about 375 B.C. He is said to have written 104 plays, mainly on mythological subjects. Some of his works parodied the early tragedies, particularly those of Euripides. Fifty titles and the extant fragments of his plays are collected in Meineke, *Fragmenta Comicorum Græcorum* (Berlin, 1839–57), and in Kock, *Comicorum Atticorum Fragmenta*, vol. ii (Leipzig, 1884).

EU'CAINE—B, $C_{15}H_{21}NO_2$, is a proprietary, unofficial analogue of cocaine, much less toxic, and used in the eye, on mucous surfaces or hypodermically as a local anæsthetic. In the form of *Beta-eucaine-lactate* the drug is more soluble and has the same action. It is also used for intraspinal anæsthesia.

EU'CALYPTOC'RINUS. An aberrant genus of fossil Crinoidea, especially remarkable for the fact that the 20 arms rest in deep vertical compartments which are formed by 10 partitions attached to the outer walls of the tegmen and supported by the interbrachials and interdistichals. The genus is found in the Silurian beds of Scotland and England and the Niagara group of North America.

EU'CALYP'TUS (Neo-Lat., from Gk. *εὖ, eu,* well + *καλυπτός, kalyptos,* covered, from *καλύπτειν, kalyptein,* to cover). A genus of trees and shrubs of the family Myrtaceæ, embracing about 150 species, all natives of Australia and Tasmania except four or five, which are found from the Malay Peninsula southward through the East Indies. The trees, of striking appearance, are quite characteristic of the Australian forests. They have entire, leathery leaves that contain considerable volatile oil. Upon the young shoots of many species the leaves are opposite and have their upper and lower surfaces disposed as in ordinary plants.

On the older twigs the leaves are arranged alternately upon the stem; each leaf is unsymmetrical with respect to its median vein and is so placed on the stem as to present its edge towards the sun—a protective device to prevent excessive transpiration in the hot climate in which the trees abound. Eucalyptus trees are among the most valuable plants of the Australian forests. Their timber is so varied as to meet almost every requirement, some kinds surpassing most timbers in their great utility. On some species is noted the occurrence of considerable quantities of manna, a hard, brittle, sweet substance containing a form of sugar known as melitose. Many species yield a kind of kino, an astringent resin, which is used in medicine and various manufactures. Tannin is a product of the bark of others, and from the leaves an oil is distilled that has many pharmaceutical and other uses, while from still others, called "stringy barks," are obtained fibers used for cordage, paper manufacture, and thatch for buildings. Eucalyptus trees have attained a more or less deserved reputation for planting in malarial districts. They are rapid-growing and present a large leaf surface through which enormous quantities of water are given off to the air. It is probable that their beneficial action is to be attributed to their drying the soil in this way rather than to any volatile substances given off by the leaves. Whatever their action, these trees have been advantageously introduced into the Roman Campagna, Cape of Good Hope, the lake region of Algiers, and elsewhere, in regions formerly noted for the presence of malaria. The species first planted with this object in view was *Eucalyptus globulus* (for illustration, see Plate of EDELWEISS), but *Eucalyptus robusta* and *Eucalyptus urnigera* are said to be better adapted to this purpose. Among the more conspicuous of the many timber trees belonging to this genus is the Jarrah wood (*Eucalyptus marginata*). This tree often attains a height of 80 feet without lateral branches, and with a diameter at the base of 5 feet. The timber is heavy, very hard, and is especially adapted to wharf, ship, and other marine uses, it being rated very highly on account of its resistance to the attacks of the shipworm and other borers. Its immunity is believed to be due to the large amount of astringent resin in the timber rather than to the hardness of the wood. *Eucalyptus amygdalina* is perhaps the largest, or at least the tallest, tree known. Trees 400 feet tall are reported as rather frequent, and one measured in southeast Australia was 471 feet in height. Another had a diameter of over 20 feet at the base, which was considerably buttressed, 12 feet at 13 feet from the ground, and 5 feet at a height of 210 feet. The timber of this species is extensively used in carpentry, as it is easily worked and does not warp readily. The tree is of rapid growth; specimens in southern France attained a height of 50 feet in eight years. The blue gum (*Eucalyptus globulus*) is a tree of rapid growth, attaining a height of 350 feet, and furnishes timber equal to the best oak or ash. It is extensively used for outdoor carpentry, telegraph poles, railway ties, etc. The Karri-Eucalypt (*Eucalyptus diversicolor*) has been described as the king of the Australian forests, and it certainly is the giant tree of the southwestern part of the continent. It is a graceful and grandly handsome vegetable production, of a growth of exceeding straightness, towering skywards, so that a forest of them looks like avenues of gigantic candles. On the Warren River the Karri gums attain an extreme height of 300 feet, with over 180 feet to the first limb, and are from 20 feet to 30 feet in circumference at the base. Locally it is known also as the white gum from its appearance. The leaves of *Eucalyptus globulus* are extensively used for the oil they contain. It is obtained by distillation, is a valuable antiseptic, has a peculiar camphor-like odor, and is extensively used in medicine and various arts. The principal constituent of the oil is eucalyptol, which is used as a diuretic, stimulant, and antiseptic, being administered in certain forms of intermittent fevers and in the dressing of wounds.

On account of their rapid growth and value for many purposes in Australia, numerous attempts have been made to introduce many of the species of Eucalyptus into California, Arizona, Florida, and elsewhere. Some of the species that are most highly prized in Australia have proved failures in California, for various reasons. The more important species for commercial planting in California are said to be the blue gum (*Eucalyptus globulus*), the sugar gum (*Eucalyptus corynocalyx*), the gray gum (*Eucalyptus tereticornis*), and the red gum (*Eucalyptus rostrata*). In Arizona most of these species have proved satisfactory when planted in the lower valleys, and in addition the desert gum (*Eucalyptus rudis*), the narrow-leaved ironbark (*Eucalyptus crebra*), and the red box (*Eucalyptus polyanthema*) have been found more resistant to cold and arid conditions than other species tested. In Florida, while specimen trees of a number of species are common southward from the central part of the State, their value for commercial planting has not been determined.

Botany Bay Kino, a secretion of many of the species of *Eucalyptus*, is used in medicine as a substitute for kino (q.v.). It is a resin having astringent and tonic properties. *Eucalyptus resinifera* was formerly considered the species which produced this substance, but a number of other species are believed to yield kino in even greater quantity. When the bark is wounded, a red sap flows freely and hardens in the air into irregular, inodorous, nearly black masses. It is also found in cavities in the trunks of the trees, is commonly called red gum, and is used as a constituent in lozenges for affections of the throat. In small, thin fragments it is of a ruby-red color. It is said to contain eucalyptin, a substance analogous to tannin. From a single tree as much as 500 pounds of kino may be obtained in a season. *Eucalyptus citriodora* is frequently grown in pots in hothouses for its lemon-scented leaves. The oil obtained by the distillation of the leaves of this species is used in perfumery.

For extended accounts of the various species of *Eucalyptus* and their uses, see J. H. Maiden, *Native Useful Plants of Australia*, and *The Descriptive Atlas* of the late Baron F. von Mueller, who has contributed more to the knowledge of *Eucalyptus* than any other person. For the status of the Eucalypts in the United States, consult: *Arizona Station Bulletin 60; California Experiment Station Bulletin 196; U. S. Dept. of Agriculture, Forest Service Bulletins 35, 87.*

EU'CHARIST. See LORD'S SUPPER.

EUCHLO'RINE (from Gk. *εὖ*, *eu*, well + *χλωρός*, *chlōros*, greenish yellow). A bright-yellow gas that is generated when potassium chlorate is treated with hydrochloric acid. It was first prepared by Sir Humphry Davy, who believed it to be a new oxide of chlorine, but later investigations have shown it to be a mixture of free chlorine and chlorine peroxide in varying proportions. It is a more powerful oxidizing agent than chlorine itself and is used for bleaching purposes and as a disinfectant.

EUCHRE, ū'kẽr (apparently from Ger. *Juchs*, joke, from the "joker" in the pack, from MHG. *juch*, *ju*, an exclamation of joy). A game of cards said to be of German origin, but now very popular in the United States. Usually 32 cards are used, the twos, threes, fours, fives, and sixes being rejected, but sometimes sevens and eights are also thrown out. Before the game is started the players cut for deal, after which the cards are cut by the person at the right of the dealer. Five cards are dealt to each player, by two at a time, and three at a time, or vice versa. The dealer turns up the top of the undealt cards for trumps. In suits not trumps the cards rank as at whist, from ace down; in the trump suit the knave (termed the right bower) is the highest trump, and the other knave of the same color, either black or red (termed the left bower), is the next highest, this card being, of course, omitted from the suit to which it would otherwise belong. The game is most enjoyable when played by four persons; but two, three, or even more than four persons may play, if the rules be adapted accordingly. In two-handed euchre the nondealer looks at his hand and decides whether he will play it. If he be satisfied and think he can make three tricks, he "orders it up." The dealer then discards his lowest and least useful card, and takes the trump card into his hand; in this case, however, the dealer must succeed in taking three tricks, or he is "euchred," and his opponent scores two points. If the nondealer be not satisfied with his hand, he says "pass." The dealer then has the option of taking up the trump as before, or of passing also. If the trump be ordered up or taken up, the play of the hand commences; if both players pass, the dealer places the trump card face upward underneath the pack, called "turning it down." The nondealer has then the privilege of naming the suit which shall be trumps, which must be another than that previously turned up. If he "make" a trump, he must succeed in taking three tricks or he is euchred; but if he pass it again, the dealer has the option of making it. If both pass a second time, the hand is thrown up, and the other player deals. When the card turned up is red, and the trump is made red, it is called "making it next"; the same with black. If the trump be made a different color from the turn up, it is called "crossing the suit." If the hand be played, the nondealer leads; the dealer plays to the card led. He must follow suit if able, otherwise he may play any card he pleases. The highest card of the suit led wins the trick; trumps win other suits. The winner of the trick leads to the next. If a player make all five tricks, he scores a "march," equal to two points; if he make three or four tricks, he scores one point.

In three-handed euchre the option of playing or passing goes to each in rotation, beginning with the player to the dealer's left. The player who orders up, takes up, or makes the trump, plays against the other two, and if they succeed in euchring him, each of them scores two points. This is often termed "cut-throat euchre," because any one of the three players is liable to be opposed by the other two.

Four-handed euchre is generally played with partners, who are cut for and sit opposite each other as at whist; if a player have a strong hand, he can decide to "play alone" single-handed against the two adversaries, and his partner cannot object; a player cannot order up his partner's trump unless he plays alone. Should the lone player succeed in making a march, he scores four; if he win three or four tricks, he scores one; if he fail to win three tricks, the opponent scores two. Sometimes, as in railroad euchre, a blank card called "little joker" or "the joker" is added, and is the highest card in the pack, the bowers following; sometimes it is agreed upon to allow the player who makes more than five points to carry the surplus (called a lap) to the next game; or to allow a "lone" player to call for his partner's best card. In French euchre only 24 cards are used, all below the nines being discarded. Another French variety called "Napoleon" has been very popular in England in recent years. After the deal the players are called upon in rotation to declare how many tricks they can take, the dealer last unless some other player shall have declared he can take the whole five tricks; if he does not, he is euchred; if he does, he collects double chips from each player; if less than five tricks is the highest bid, and he wins the number he declares, he collects single chips from each player.

Progressive Euchre. A popular form of the game, in which a large number of players take

1. THE BLUE GUM (Eucalyptus globulus) showing its habit when growing alone.

2. AN AVENUE OF EUCALYPTUS TREES.

part, the players being seated at tables numbered consecutively from one upward to as many as may be necessary. The players being seated, four at each table, the games begin according to the regular four-handed game. No. 1 is the head or king table, and the players seated at this govern the game as far as time is concerned. The signal is given by ringing a bell at the head table. Lone hands only count two points at this table. If there is a tie at any of the other tables, the winner is decided by cutting the cards or dealing another hand. The progression consists of the winners moving from a lower table to the next higher, the losers remaining in their seats. The game continues to revolve in this fashion until the time fixed for the limit of the game. Each player keeps tally of the games won or lost individually. These games are then summed up. To the two who have won the most games the first prize is awarded.

EUCKEN, oik′en, Rudolf Christoph (1846–1926). A German philosopher. He was born at Aurich, East Friesland, and studied philology, history, and philosophy at Göttingen and Berlin. He was professor of philosophy at Basel from 1871 to 1874 and thereafter held the corresponding chair in the University of Jena. He became one of the leaders of the revolt in Germany against the tendency to treat man and life from the point of view solely of the physical and biological sciences, and emphasized the spiritual interests. His inspirational style has made him very popular among a wide circle of readers. He was awarded the Nobel prize for literature in 1908 and received honorary degrees from various foreign and American universities. In 1912–13 he was an exchange professor at Harvard University and in 1914 at the universities of Tokio and Kioto, Japan. His works include: *Geschichte und Kritik der Grundbegriffe der Gegenwart* (1878; 2d ed., 1893; Eng. trans., *The Fundamental Concepts of Modern Philosophic Thought*, 1880); *Beiträge zur Geschichte der neuern Philosophie, vornehmlich der deutschen* (1886); *Die Philosophie des Thomas von Aquino und die Kultus der Neuzeit* (1886); *Die Einheit des Geisteslebens* (1888; Eng. trans., *The Life of the Spirit*, 1909); *Die Lebensanschauungen der grossen Denker* (1890; 3d ed., 1899; Eng. trans., *The Problem of Human Life as Viewed by the Great Thinkers* (1910); *Der Kampf an einen geistigen Lebensinhalt* (1896); *Geistige Strömungen der Gegenwart* (3d ed., 1904; Eng. trans., *Main Currents of Modern Thought*, 1912); *Grundlinien einer neuen Lebensanschauung* (1907; Eng. trans., *Life's Basis and Life's Ideal*, 2d ed., 1912); *Religion and Life* (1911); *Can we Still be Christians?* (1914). His *Collected Essays* were translated and edited by Meyrick Booth (London, 1914). Among his articles which have been translated into English are the following: "Liberty in Teaching in the German Universities" (1897); "Are the Germans still a Nation of Thinkers?" (1898); "Progress of Philosophy in the Nineteenth Century" (1899); "The Finnish Question" (1899); "The Philosophy of Friedrich Froebel" (1900); "The Present Status of Religion in Germany" (1901). Consult: Pöhlmann, *R. Euckens Theologie mit ihren philosophischen Grundlagen* (Berlin, 1902); Siebert, *R. Euckens Weld und Lebensanschauung* (Langensalza, 1904); Gibson, *Rudolf Eucken's Philosophy of Life* (New York, 1907).

EU′CLASE (from Gk. *εὖ*, *eu*, well + *κλάσις*, *klasis*, break, from *κλᾶν*, *klan*, to break). An aluminium and glucinum silicate that crystallizes in the monoclinic system. It is a transparent, pale-green, sometimes blue, mineral, found chiefly in schistose rocks in Brazil, especially at Villa Rica, and also in the southern Ural. Its great hardness and its capacity for taking a polish make it of value as a gem stone, but its rarity prevents its extensive use. It is also called *prismatic emerald*.

EUCLID, ū′klĭd (Gk. Εὐκλείδης, *Eukleidēs*). The most famous of the Greek writers on geometry. He flourished at Alexandria, but nothing is known of his life except that Proclus tells us that he lived in the time of Ptolemy I (who reigned 306–283 B.C.). It is probable that the period of his greatest activity was in the neighborhood of 300 B.C. His fame was so great among the Greeks that he was called *ὁ στοιχειωτής*, 'the author of the Elements,' and even to-day the name Euclid is synonymous with elementary geometry. His *Στοιχεῖα*, or 'Elements,' were well known to the Arabs, a portion having been translated in the time of Harun-al-Rashid, a second (complete) translation being made under Al-Mamun, and other translations appearing later. It was translated from Arabic into Latin by Adelard of Bath (c.1120), from a copy obtained in Spain; and this translation, or this one revised by Giovanni Campano (1260), was printed in 1482 at Venice. It was also translated, at least in part, by other scholars of the twelfth century. Who it was who first translated the work from the Arabic is, however, quite unknown. There is internal evidence to lead to the belief that Plato of Tivoli, Adelard, and Campano all had access to a common translation. Billingsley's translation from the Latin into English appeared in 1570. The extant works unquestionably ascribed to Euclid are: the *Elements* (Στοιχεῖα); the *Data* (Δεδομένα); the *Phenomena* (Φαινόμενα); the *Optics* ('Οπτικά); the *Reflections* (Κατοπτρικά); the *Division of the Scale* (Κατατομὴ κάνονος), and a work, *De Divisionibus*, known only through the Arabic. The best editions of Euclid's works are: Heath, *The Thirteen Books of Euclid's Elements* (3 vols., Cambridge, 1908); Peyrard, *Les œuvres d'Euclid en grec, en latin et en français* (3 vols., Paris, 1814–18); Heiberg and Menge, *Opera Omnia* (7 *vols.*, Leipzig, 1883–96). One of the best biographies of Euclid is that by De Morgan, in Smith's *Dictionary of Greek and Roman Biography* (under *Eucleides*). Consult also Gow, *History of Greek Mathematics* (Cambridge, 1884), and the authorities referred to under Mathematics.

EUCLID, or **EUCLI′DES**, of Megara (Gk. Εὐκλείδης, *Eucleides*). A native of Megara (fifth century B.C.), founder of the Megarian school of philosophy. He was early influenced, apparently, by the works of Parmenides (q.v.), from whom he learned not only philosophy, but the art of disputation. The fame of Socrates attracted him to Athens, where he became a devoted follower of the great teacher (consult Aulus Gellius, 7, 10). He established a school of his own at Megara, the teaching of which was distinguished by its combination of Socratic and Eleatic principles. (See Socrates; Eleatic School.) To Euclid, as to Socrates, virtue was knowledge. Euclid held to the unity of Being, as taught by Parmenides. This self-identical Being, he taught, is the only reality and constitutes the good; it is not sensuous but intellectual being, i.e., reason, truth, which is for man the *summum bonum*. After Socrates' death (399 B.C.) Plato and other disciples attached themselves for a time to the Megarian school. From Euclid Plato probably got the germs of his doctrine of ideas (εἴδη), a technical term, which Euclid introduced into philosophy. Euclid devoted himself especially to dialectics or logic. In antiquity six dialogues were current under Euclid's name, but their authenticity was doubted; of these nothing but the titles has survived. See EUBULIDES.

Consult: Deychs, *De Megaricorum Doctrina, etc.* (Bonn, 1827); Mallet, *Histoire de l'école de Mégare* (Paris, 1845); Hartenstein, "Ueber die Bedeutung der Megarischen Schule," in his *Historisch-philosophische Abhandlungen* (Leipzig, 1870); Ritter and Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1913); Zeller, *Philosophie der Griechen*, ii (Leipzig, 1889); Ueberweg, *History of Philosophy*, trans., vol. i (New York, 1872); Gomperz, *Greek Thinkers*, vol. ii (ib., 1905); Windelband-Bonhöffer, *Geschichte der antiken Philosophie* (Munich, 1912); Burnet, *Greek Philosophy*, Part I (London, 1914).

EUDÆ'MONISM (Gk. *εὐδαιμονισμός, eudaimonismos*, thinking one happy, from *εὖ, eu*, well + *δαίμων, daimōn*, genius, spirit). The Aristotelian view that the chief end of human life is happiness, and that happiness is not pleasure, but an activity desirable not as a means to some further end, but for its own sake. What this activity is, is discoverable, according to Aristotle, by ascertaining what the distinctive function of man is. The distinctive function of man is an activity of the soul in accordance with reason. Hence human happiness is the activity of soul in accordance with virtue, virtue being the mean between excess and defect as determined by reason. Pleasure is an essential element in such a life, for "pleasure and life are yoked together and do not admit of separation, as pleasure is impossible without activity and activity is perfected by pleasure." See ENERGISM.

EUDE'MUS (Lat., from Gk. Εὔδημος), OF RHODES. A Greek philosopher. He was a disciple and friend of Aristotle (q.v.). He composed a number of works defending the doctrine of his master and is probably the author of the *Eudemian Ethics*, published with Aristotle's writings, and in large part a reproduction of Aristotle's own work, the so-called *Nicomachean Ethics*. Eudemus also wrote, among other books, a history of mathematics and astronomy, which, however, is not extant. A summary of it appears, however, in a commentary on Euclid the mathematician written by Proclus (c.410–485 A.D.), and numerous extracts are found in the works of later writers. Spengel collected the fragments of these works that still exist (1866; 2d ed., 1870). Mullach also published them in his *Fragmenta Philosophorum Græcorum*, vol. iii (1881). Consult also Gow, *History of Greek Mathematics* (Cambridge, 1884), and Ueberweg-Prächter, *Grundriss der Geschichte der Philosophie* (10th ed.).

EUDES. See ODO.

EUDES, ēd (also called EUDON, EUDO, and ODO), DUKE OF AQUITAINE (?–735 A.D.). He was independent ruler of southern France from the river Loire to the Pyrenees. In 721 he signally defeated the Arabs under Es-Samah, who had besieged his capital of Toulouse. A treaty with Austrasia was broken in 731, and Charles Martel began to harass northern Aquitaine. At this juncture the Arabs, commanded by Abd-er-Rahman, reinvaded France. Eudes appealed to Charles, and a joint army, directed by the latter, won the decisive victory of Tours (732, known in French history as the battle of Poitiers). Consult Vic and Vaissette, *Histoire générale de Languedoc* (new ed., 16 vols., Toulouse, 1872–1904).

EUDES, ēd, JEAN, VENERABLE (1601–80). The founder of the Roman Catholic congregation of the Eudists. He was born at Ri, France, Nov. 14, 1601, educated at the Jesuit College at Caen, entered the Congregation of the Oratory in Paris (1623), was ordained priest (1625), rose to be the superior of the Oratory at Caen (1639), and then founded in 1643 the Congregation of the Mission Priests of Jesus and Mary for the purpose of giving instruction to priests in practical and missionary work. The members are called, commonly, Eudists. They resemble the Oratorians in that they are all priests, take no vows, and are at liberty to leave the congregation when they please. They are under episcopal jurisdiction. Their rule was approved by the Pope in 1674. They met the rivalry and jealousy of the Oratorians, and the more since the latter were more or less affected by Jansenism, which the Eudists resisted. Seminaries were opened in various places before the death of Eudes at Caen, Aug. 19, 1680. The congregation was in great favor under Louis XVI, fell in the confusion of the time and was dissolved in 1794, but was reorganized in 1826. The "Law of Associations" suppressed the houses of the congregation in France. In Canada in 1914 they had 15 establishments and about 150 priests. In 1641 Eudes founded the Order of Daughters of Our Lady of Charity of the Refuge, for the rescue and restoration of fallen women, which under slightly different names still exists. In 1903 Leo XIII bestowed on him the title "Author of the liturgical worship of the Sacred Heart of Jesus and the Holy Heart of Mary." The miracles proposed for his beatification were approved in 1908. Consult Montzey, *Le père Eudes et ses instituts* (Paris, 1869).

EU'DIOM'ETER (from Gk. *εὔδιος, eudios*, clear weather + *μέτρον, metron*, measure). A graduated glass tube used in the analysis of gases. Joseph Priestley used such an apparatus to determine the quantity of oxygen in atmospheric air; and hence the name, which signifies "measure of purity." A eudiometer may be either straight, U or V shaped. Near its sealed end it may be provided with platinum electrodes fused into the glass; by means of these, gases may be caused to combine in the tube under the influence of electric sparks, and then the change of volume caused by the reaction is directly shown by the eudiometer.

EUDO'CIA (Lat., from Gk. *Εὐδοκία, Eudokia*). The name of several Byzantine princesses, of whom the most important, known at first as Athenaïs, was later the wife of the Emperor Theodosius II. She was born about 393, the daughter of the sophist Leontius, or Leon, and was educated by her father, especially in rhetoric and literature. Her accomplishments and her singular beauty were reckoned by Leontius a sufficient fortune, for at his death he left all his property to her two brothers. To get a share of the property Eudocia appealed against her brothers to the Emperor at Constantinople. Pulcheria, the sister of Theodosius, was interested in the maiden and thought she would make a suitable wife for the Emperor. She was married to the Emperor in 421 A.D. For many years, however, Pulcheria ruled in the Imperial household and councils, Eudocia, according to Nicephorus, "submitting to her as mother and Augusta"; but in 447 a quarrel broke out between them in regard to the Eutychian heresy, of which Eudocia had become a supporter. (See EUTYCHES.) At first Eudocia was triumphant, and Pulcheria was banished; but in a short time the Emperor was reconciled to his sister and treated Eudocia so harshly that she retired to Jerusalem, where she died 460–61 A.D. Her latter days were spent in works of piety and charity. Through the influence of the famous Simeon Stylites, she was induced to renounce Eutychianism and become an orthodox Catholic Christian. She wrote a poem in heroic verse on the victory obtained by the troops of Theodosius over the Persians, 421 or 422 A.D.; a paraphrase of eight books of Scripture; a paraphrase of Daniel and Zechariah; and a poem in three books on the history and martyrdom of Cyprian and Justina. A work called *Homerocentones*, composed of verses taken from Homer, and so arranged as to give a history of the fall of man and of his redemption by Christ, has also (but without sufficient reason) been attributed to her. Consult: Gregorovius, *Athenaïs* (Leipzig, 1892); Ludwich, *Eudociæ Augustæ Carminum Reliquiæ* (Königsberg, 1893); *Cambridge Medieval History*, vol. i (New York, 1911).

EUDO DE STELLA. See EON.

EUDOX'IA FEODOROVNA, fā'ô-dô-rôv'nȧ (1669–1731). A czarina of Russia. She was the daughter of the Boyar Feodor Lopukhin, and at the age of 19 was married to Peter the Great, who was at that time 17. Her family belonged to the Conservative party, and this fact and her staid piety alienated Peter from her. In 1698, apparently for refusing to agree to a divorce, she was imprisoned in the convent of Susdal. Upon the trial of her son Alexis she was brought to Moscow (1718), and was tried for adultery and forced to confess her guilt; and upon the condemnation of Alexis she was transferred to the monastery of Staraya Lodoga, near Schlüsselburg. In 1728 the accession to the throne of her grandson, Peter II, enabled her to return to Moscow, where she died.

EUDOX'US (Lat., from Gk. Εὔδοξος, *Eudoxos*) (c.408–355 B.C.). One of the most prominent of the Greek mathematicians. He was born in Cnidus, was a pupil of Archytas, who was head of the Pythagorean school at Tarentum, and studied for a few months under Plato. He founded a school at Cyzicus. Diogenes Laërtius speaks of him as an astronomer, physician, legislator, and geometer. It is thought that Euclid, v, and xiii, 1–5, dealing with proportion and the five regular polyhedra, is largely due to him. He is said to have invented a curve called the *ἱπποπέδη* (horse fetter), like an 8 on its side.

EUDOXUS, OF CYZICUS. A Greek explorer, who in the latter part of the second century B.C. explored, for Ptolemy Euergetes, the Arabian Sea. Later, working independently, he made two voyages along the west coast of Africa. Strabo made use of his discoveries. Consult Bunbury, *History of Ancient Geography*, vol. ii (London, 1879).

EUFAU'LA. A city in Barbour Co., Ala., 80 miles by rail east-southeast of Montgomery, on the Chattahoochee River, and on the Central of Georgia Railroad (Map: Alabama, D 4). It is a shipping point of some importance and has manufactures of cotton goods, cottonseed oil, buggies, and fertilizers. The water works and lighting plant are owned and operated by the city. Pop., 1900, 4532; 1910, 4259.

EUGA'NEAN HILLS (named after the ancient Italic tribe of *Eugaine*). A range of hills in the western part of the Province of Padua, near Padua, north Italy (Map: Italy, F 2). They are of volcanic formation and quite isolated. The highest point, Monte Venda, has an altitude of over 1900 feet. The range contains a number of mineral springs and valuable stone and marble quarries.

EUGANEI. See EUGANEAN HILLS.

EUGEN, oi-gān', FRIEDRICH KARL, DUKE OF WÜRTTEMBERG (1788–1857). A Russian general, born at Oels, Germany. His father's sister was the wife of the Emperor Paul of Russia. While still a child, he was created major general. He participated in the campaign of 1806–07 in Prussia and of 1810 in Turkey. He was made lieutenant general after the battle of Smolensk (Aug. 17, 1812) and distinguished himself in the engagements at Borodino, Tarutino, Krasnoi, Lützen, Bautzen, Kulm, and Leipzig. He was commander of the Seventh Russian Army Corps during the Russo-Turkish War of 1828 and retired from the service after the Peace of Adrianople, devoting himself to study. He composed some music, including Lieder, symphonies, and an opera *Die Geisterbraut*, which was produced in Breslau in 1830. His principal works are *Erinnerungen aus dem Feldzuge des Jahres 1812 in Russland* (1846) and *Memoiren* (1862), a volume of interesting recollections.

EUGENE, ū-jēn'. A city and the county seat of Lane Co., Oreg., 124 miles by rail south by west of Portland, on the Willamette River, and on the Southern Pacific, the Oregon Electric, and the Portland, Eugene, and Eastern railroads (Map: Oregon, B 3). The University of Oregon, opened in 1876, and the Eugene Bible University are situated here, and there is a Carnegie library. The city is the commercial centre for the fertile agricultural country of the upper Willamette valley, which is noted for its wealth of timber, and which also contains deposits of gold and silver. The industrial establishments include canneries, flouring, woolen, saw, and planing mills, sash, door, furniture, and excelsior factories, ironworks, and machine shops, tanneries, brickyards, etc. Under a charter of 1893 the government is vested in a mayor, elected biennially, and a municipal council. Eugene was first settled in 1854 and was incorporated 10 years later. It owns its water works and electric-light plant. Pop., 1900, 3236; 1910, 9009; 1914 (U. S. est.), 12,083; 1920, 10,593.

EUGÈNE, ẽ'zhän', FRANÇOIS (1663–1736). A celebrated Austrian general, best known as Prince Eugène of Savoy, his full name being François-Eugène de Savoie-Carignan. He was the son of Eugène Maurice, Count of Soissons and of Olympia Mancini, a niece of Cardinal Mazarin, and was born in Paris, Oct. 18, 1663. The banishment of his mother to the Low Countries, by the order of Louis XIV, and the refusal of the King to grant him a commission in the army, so incensed Eugène against France that he indignantly renounced his country and entered the service of the Emperor Leopold I as a volunteer against the Turks. Though barely 20 years of age and without military training, he displayed extraordinary talents in war, especially at the famous siege of Vienna in 1683. He soon rose to a high position in the army. In the war of the Coalition against Louis XIV (1689–97) he took an active part in the fighting in Italy and in 1691 was raised to the command of the Imperial army in Piedmont. It was about this time that Louis XIV offered him the bâton of a marshal of France, the generalship of Champagne, and a large pension, but Eugène refused all such advances. In 1693 he was made a field marshal of Austria, and on his return to Vienna he was placed at the head of the army of Hungary and defeated the Turks, with immense slaughter, in the famous battle of Zenta, Sept. 11, 1697. In 1701 the War of the Spanish Succession broke out, and Eugène was put in command of the army in Italy; but his forces were too small for him to accomplish anything of importance. In the year 1703, being appointed president of the council of war, he became thenceforth the prime mover of every military undertaking. He first took the command of the Imperial army in Germany, and with Marlborough gained a brilliant victory at Blenheim, Aug. 13, 1704, over the French and Bavarians. Eugène afterward saved Turin, and expelled the French from Italy in the year 1706. He shared, too, with Marlborough the glory of the fields of Oudenarde in 1708 and Malplaquet in 1709; but, being crippled in his resources by the retirement of Holland and England from the contest, he was unable to withstand the enemy on the Rhine. The defeat of his Dutch allies by Villars at Denain, July 24, 1712, was followed by other disasters, until the Peace of Rastadt (1714) put an end to the war.

In 1716, on the renewal of the war against the Turks, Eugène defeated an army of 180,000 men at Peterswardein, took Temesvâr, and in the year 1717, after a bloody battle, gained possession of Belgrade. After the Peace of Passarowitz, which was concluded in the following year, he returned to Vienna, where during the succeeding years of peace he labored with unwearied energies in the cabinet. When the question of the succession to the throne of Poland brought on a new war with France (1733–35), Eugène appeared again on the Rhine; but, being now advanced in years and destitute of sufficient resources, he was unable to accomplish anything of importance. After the peace he returned to Vienna, where he died April 21, 1736, leaving an immense fortune to his niece, the Princess Victoria of Savoy. In his later years he was a patron of art and literature. Among the common people of Germany and Austria his fame lives in songs, as "Prinz Eugen der edle Ritter"; his reputation as a great military leader is firmly established.

Bibliography. The most elaborate work on Prince Eugène is that of Arneth, *Prinz Eugen von Savoyen* (Vienna, 1858): for a popular biography, consult Malleson, *Prince Eugene of Savoy* (London, 1888). Other important works are: Kausler, *Das Leben des Prinzen Eugen von Savoyen, etc.* (Freiburg, 1838–39); Von Sybel, *Prinz Eugen von Savoyen* (Munich, 1861): Heller, *Militarische Korrespondenz der Prinzen Eugen von Savoyen, etc.* (Vienna, 1848): Von Landmann, *Die Begründung der Grossmachtstellung Oesterreich-Ungarns Prinz Eugen* (Munich, 1905).

EUGENE ARAM, ū-jēn′ â′ram. A novel by Bulwer Lytton, published in 1832. See ARAM, EUGENE.

EUGENE ONEGIN, oi′gân ô-nâ′gēn. An opera by Tschaikowski (q.v.), first produced in Moscow, March 29, 1879; in the United States, Feb. 2, 1908 (New York, in concert form).

EUGE′NIA. See MYRTACEÆ.

EUGEN′ICS (from Gk. *εὐγενής, eugenes*, well born). The science of the improvement of the human race by better breeding. The modern movement for the adoption of various eugenic principles owes its inception as well as much of its present status to the consistent efforts of the late Sir Francis Galton, by whom the word "eugenics" was first employed. Galton was interested both in the scientific and in the practical aspects of the subject. On the scientific side his thinking was much influenced by the biological researches of his more famous cousin, Charles Darwin. A number of the biological principles upon which the science of eugenics rests were known, however, much earlier than Darwin's time. By means of these principles agriculturalists and stock breeders had long been making innumerable improvements in the quality of plants and animals. As Darwin himself pointed out, the principle of selection, the most fundamental of all the principles emphasized by the eugenist, was known even to the ancient Chinese. Explicit rules of selection appear also in the works of some of the Roman classical writers. The principle of selection did not attract much notice from scientists, however, until Darwin published his *Origin of Species* (1859). This book quickly drew attention to the fact that man, like the lower animals, has passed through a long evolution in which his bodily and probably his mental characteristics have been materially altered. The notion that further modifications of a desirable sort might be brought about in the race by purposive selection of innate traits inevitably followed. Thus Darwin laid the theoretical basis for eugenics. It was the publication of Galton's two famous articles on "Heredity, Talent and Character" in *Macmillan's Magazine* for July and August, 1865, however, that may be said to have definitely inaugurated the attempt to apply biological theories to the practical problem of the improvement of the human race. Impressed by the plasticity of the physical forms of animals under the breeders' selection, Galton in these articles announced his purpose of showing more pointedly than had hitherto been attempted that the mental qualities of men are equally under control. His main thesis was that inherited ability was the chief reason for the recurrence of talent in distinguished families. This thesis he supported by a mass of biographical evidence to show how strikingly the frequent occurrence of able sons of able men indicates that mental qualities quite as much as physical traits are subject to the principles of natural inheritance. The practical conclusion he expressed in characteristically striking fashion. "How vastly would the offspring be improved," he exclaims, "supposing distinguished women to be commonly married to distinguished men, generation after generation . . . according to rules of which we are now ignorant, but which a study of the subject would be sure to evolve." Four years later, in 1869, appeared Galton's monumental work *Hereditary Genius.* In this—the classic of eugenic literature—Galton not only reiterated his belief in eugenic principles, but with highly scientific precision attempted to apply mathematical principles of the law of deviation from an average to the determination of the frequency with which the occurrence of talented progeny from talented ancestry might be expected normally. In this same work was incorporated a chapter on "Influences that Affect the Natural Ability of Nations." In this chapter are marshaled facts and arguments to show how actual modifications of human quality have occurred by means of influences that are or can be made subject to man's own control. The sterilizing effect upon the ability of subsequent generations produced by the decimation of talented men during the Spanish Inquisition is emphasized. In the same work, also, is clearly stated the evident but tremendously significant fact that, other things being equal, the group or nation which, on the average, has the least interval between generations and which possesses the highest average fertility will, through the mere fact of superiority in the rate of increase, eventually outnumber and overcome competing groups or nations.

Such, then, were the beginnings of a science, itself hardly yet beyond the period of infancy.

For many years after these beginnings little was accomplished in the immediate field of eugenics. During the latter quarter of the nineteenth century, however, practically all biologists became convinced of the soundness of Darwin's fundamental position. The public also became less skeptical of biological doctrines. When, therefore, in 1900 there occurred two events of prime importance for eugenics, the ground was prepared for widespread interest in the entire subject. The first of these two events was a lecture on "National Life from the Standpoint of Science," delivered at Newcastle, England, by Prof. Karl Pearson, perhaps the most ardent of all Galton's disciples. The other event was the rediscovery by four independent experimenters of the biological relationship now known as the Mendelian laws of heredity. Pearson's lecture abounded with such vigorous statements as these: "Bear in mind that one-quarter only of the married people of the country—say a sixth to an eighth of the adult population—produce 50 per cent of the next generation. You will then see how essential it is for the maintenance of a physically and mentally fit race that this one-sixth to one-eighth of our population should be drawn from the best and not from the worst stocks. A nation that begins to tamper with its fertility may have changed its national characteristics before two generations have passed." Coming, as it did, when the English nation was wondering whether the reverses it had sustained in South Africa might not indicate a definite deterioration in the quality of the population of the country, Pearson's lecture created a profound impression upon the public mind. On the other hand, the rediscovery of the principles which had been announced by Gregor Mendel in 1866, but which had been forgotten, created an equally profound impression upon the biologists. The result was a revival of interest in theories of heredity. Moreover, the fact that the Mendelian laws were discovered by the experimental method caused the enthusiastic adoption of this method, in biology, by investigators throughout the world.

How significant for the science of eugenics these developments have proved can be appreciated only by those who thoroughly understand the biological principles involved. For out of the differences in the views of those who, like Karl Pearson, have followed Galton's lead and the views of those who, like Prof. Charles B. Davenport, director of the Eugenics Laboratory at Cold Spring Harbor, N. Y., have been impressed chiefly with the importance of the Mendelian laws and the results of the experimental method, there has grown up a mass of controversial literature that it would be impossible to summarize here. The chief theoretical problems, however, may be indicated briefly, and their importance for eugenics pointed out. The controversial points are largely in the field of the theory of heredity. Preliminary to their discussion a short statement of certain general biological and eugenic principles accepted by both schools will be advantageous.

The fundamental doctrine of eugenics, as before indicated, is that of selection. Selection, in the biological and eugenic sense, occurs when within a species one organic type differing from another in hereditary characteristics contributes a larger proportion of progeny to the next generation than does the type from which it differs. Thus, inasmuch as certain types of feeble-mindedness tend to be hereditary, selection will operate to increase the proportion of feeble-minded in the next generation if feeble-minded persons have more progeny, on the average, than do parents who are normal. Contrary to a somewhat popular belief, however, selection in the biological sense does not occur, in all probability, if the differences in parental types are merely due to training. Thus, e.g., there is probably no selective effect when parents who differ from others merely because they are highly educated contribute a greater or less proportion of progeny to the next generation than do uneducated parents. This is because education is an acquired trait and is not transmitted by heredity. If, however, it could be proved that the educated classes are possessed, on the average, of greater natural ability than are the uneducated classes in any community, then a selective effect would be shown to occur whenever one class is more fertile than another, provided, of course, the differences in natural ability between the two classes tend to reappear in the offspring. Neither Pearsonian nor Mendelian doubts the fact that some classes of persons are more fertile than other classes, and that profound social and probably important eugenic changes are the result of such differences.

The real problem is one of heredity and may be stated as follows: *first,* do different classes of men differ in important hereditary traits? *Second,* if so, do they transmit their differences in full force or in diminished intensity? *Third,* is the transmission of significant traits to all of the progeny or only to some? *Fourth,* if only to some, what is the probability that a given proportion of the progeny will inherit a given amount of the characteristic? *Fifth,* can the characteristics of progeny be predicted in the case of individuals or only on the average for large numbers? *Sixth,* are different traits inherited independently, or, if one characteristic of an ancestor is shown to reappear in a way capable of definite statement, do other characteristics of the same ancestor reappear in the same way? An illustration of each point will show the relation of each to the problem of better breeding. *First*, it makes little difference to the welfare of man whether blue-eyed parents tend to produce blue-eyed children. It is of profound importance if mentally gifted parents have gifted children. *Second*, if the children are gifted in a degree equal to that of their parents, the stock will not deteriorate; if, however, there is a diminished intensity of the trait inherited, the stock will become mediocre in a few generations. *Third*, if all the children inherit a desirable trait, the desirable effect, upon the next generation of the population, of a few fertile marriages of persons of talent will be greater than if only a portion of the children do so. *Fourth*, if only a portion of the children inherit the gift, the degree of effect upon the next generation will depend upon the proportionate number who do inherit the trait. *Fifth*, unless the characteristics of the progeny of particular individuals can be predicted, practical efforts to increase or diminish the fertility of particular individuals are useless. Average results would confine practical measures entirely to encouraging or discouraging the fertility of large classes of men. Action against an individual who belonged to a class whose progeny contained on the average a large proportion of persons possessing undesirable innate traits could profitably be taken only on the ground that the probability of undesirable progeny was so great that social expediency required the suppression of the stock, in spite of the possibility that the progeny of that particular individual might prove to be entirely normal.

In addition to the foregoing points there are, of course, many other important questions involved. Not the least among these is the determination in the case of a given individual whether a given trait deemed desirable or undesirable is, as a matter of fact, an hereditary trait or whether it is a trait due merely to the peculiar circumstances in which the individual's life has been passed. From the foregoing it will appear that the theoretical problems of eugenics are not simple. Thus far only a beginning has been made towards their solution. With Galton, the scientifically minded man must still confess ignorance, for the most part, of the particular rules by which to render eugenic progress a certainty. The reasons for this ignorance will appear by briefly indicating the various positions that are held by scientists of repute on some of the theoretical points just enumerated. With respect to the following statement, however, it must be remembered that not only are innumerable controversial details involved, but also that frequent additions to knowledge are being made in the details of each subject. The first of the enumerated points, of course, involves the whole eugenic question. The eugenist holds that men differ greatly in important hereditary mental as well as physical traits. He has reputable opponents who hold the contrary. Pointing to the unity of all organic life, the eugenist emphasizes the fact that biological laws which hold for animals and in many instances are known to be true of man's physical characteristics could hardly fail to hold true of many of his mental traits. He thinks that the known hereditary character of feeble-mindedness and of various forms of nervous diseases is but one of the more readily detected instances. He contends that the great frequency with which eminent men are the sons or near relatives of eminent men—a fact of which there is abundant evidence in the researches of Galton and others—proves beyond a doubt that important hereditary differences exist among individuals. The extreme eugenist may even emphasize these differences to the extent of holding that different races of men are much superior in native mental ability to others. Some scientists, on the other hand, like the late Prof. Lester F. Ward and the anthropologist Prof. Franz Boas, have held that there is little if any difference in average innate mental ability among different races. These writers also contend that the differences among individuals within any given race are far greater than whatever differences there may be among the races themselves. In consequence these writers hold that some men of every race are likely to show a high degree of ability. They hold also that eminent men have eminent progeny in large part because they provide exceptional opportunities for their offspring. Argument on these general grounds, however, is not extremely fruitful. Better results may be anticipated from the recording, generation after generation, of the various mental traits of individuals who are related by birth and deducing laws of heredity in man from facts which, to some extent at least, can be freed from the effects of environmental as opposed to hereditary influences. Work of this character has been started by Davenport at the Eugenics Record Office in Cold Spring Harbor, N. Y., and also under the direction of the Eugenics Laboratory in England. One of the most hopeful developments in this field is the so-called "Binet test," by means of which various mental traits of individuals are measured with some degree of accuracy. Another development of importance is Professor Thorndike's systematic studies, undertaken at Columbia University, to ascertain the degree of separability among mental traits (i.e., whether mental ability is a general or a complex fact). On the basis of such work as these men are doing it may become possible eventually to state positively and in quantitative form the degree to which men differ in innate traits rather than merely to assume that they do differ.

With respect to the other five questions there is a fundamental difference of approach within the ranks of the eugenists. These differences in method yield differences in results. The five questions require quantitative analysis, and both schools present their results in statistical form. The Pearsonian, however, is always stating averages obtained from large numbers of cases. The Mendelian is always presenting the facts gleaned from experiments upon individual lines of inheritance. There have been many attempts to reconcile the results of both schools, but none have attained complete success. Other differences in the results of the two schools arise, however, from differences in underlying biological assumptions. The Pearsonians—or Biometricians, as they are often called—assume that the traits of individuals vary to a greater or less extent from a normal or usual value. For example, the average height of 683 upper middle-class English males was found by Galton to be 69.215 centimeters. Some of the individuals, of course, were taller and some were shorter—there were variations from the average height. The Mendelians, on the other hand, have studied for the most part traits that are termed alternative. For example, a person is either blue-eyed or he is not. It may ultimately prove that the first assumption is true with respect to some traits, and that the second is true with respect to others. The difference is a fundamental one. It is of great practical significance, also, because under certain conditions an alternative character which "Mendelizes" may entirely disappear in a single generation from certain lines of progeny. See HEREDITY, section on *Mendelian Laws*, paragraph on "Segregation."

Under such circumstances, therefore, the complete disappearance of an objectionable Mendelian trait could be brought about by selective mating in a single generation. Another difference between the schools arises from the fact that the Biometricians deal with traits as simple which upon further investigation may prove to be complex. Stature, conceivably, may be the resultant of three "unit" characters—one determining height of the cranium, another the length of neck and trunk, and a third the length of the legs. It may easily be proved that from the standpoint of eugenics, as Davenport holds, sitting height is more important than standing height. And so also with other more significant characteristics. If mental ability should prove to be the resultant of many "unit" characters, as, from the Mendelian point of view, seems probable, and if each of these "unit" characters happens to follow different modes of inheritance, as might also prove to be the case, the problem of controlling the inheritance of such a complex set of characters would evidently be one of great difficulty. Up to the present time examples of the operation of the Mendelian laws, however, have been found chiefly among the lower animals and plants. In a small number of cases only have the traits of man, thus far, been shown to follow these laws. Eye color, brachydactylism, certain forms of cataract, various affections of the skin and hair, color blindness, and night blindness are representative examples. The frequency of abnormalities in this list is due, probably, to the fact that records for several generations are required to demonstrate the law, and abnormalities attract notice more than variations in normal traits. There is little doubt that many other human traits of far more importance than these will be shown, eventually, to follow the Mendelian laws of inheritance. Until proof is adduced, however, concerning the applicability of the Mendelian laws to important mental traits in man, it is evident that the practical measures possible wherever these laws operate must await further extension of knowledge.

From the foregoing it is apparent that the problem of eugenics is essentially biological in its nature. Its future development depends upon the future of the biological sciences, and no amount of popular agitation will hasten the attainment of adequate biological knowledge.

These facts, however, in no wise militate against the practical utilization of such knowledge as is already possessed. Thus, the following suggestions of Galton made in addresses to the London Sociological Society can hardly be dismissed as useless:

"1. Dissemination of a knowledge of the laws of heredity so far as they are surely known, and promotion of their farther study. Few seem to be aware how greatly the knowledge of what may be termed the actuarial side of heredity has advanced in recent years. . . .

"2. Historical inquiry into the rates with which various classes of society (classified according to civic usefulness) have contributed to the population at various times, in ancient and modern nations. There is strong reason for believing that national rise and decline is closely connected with this influence. It seems to be the tendency of high civilization to check fertility in the upper classes, through numerous causes, some of which are well known, others are inferred, and others again are wholly obscure.

"3. Systematic collection of facts showing the circumstances under which large and thriving families have most frequently originated; in other words, the conditions of eugenics. . . .

"4. Influences affecting marriage. Social influences of all kinds have immense power in the end, and they are very various. If unsuitable marriages from the eugenic point of view were banned socially, or even regarded with the unreasonable disfavor which some attach to cousin marriages, very few would be made. The multitude of marriage restrictions that have proved prohibitive among uncivilized people would require a volume to describe.

"5. Persistence in setting forth the national importance of eugenics. There are three stages to be passed through. First, it must be made familiar as an academic question, until its exact importance has been understood and accepted as a fact; secondly, it must be recognized as a subject whose practical development deserves serious consideration; and, thirdly, it must be introduced into the national conscience, like a new religion. . . . I see no impossibility in eugenics becoming a religious dogma among mankind, but its details must first be worked out sedulously in the study. Overzeal leading to hasty action would do harm.

"The first and main point is to secure the general intellectual acceptance of eugenics as a hopeful and most important study. Then let its principles work into the heart of the nation, who [sic] will gradually give practical effect to them in ways that we may not wholly foresee." These suggestions, it will be noted, are conservative. They emphasize the study of conditions rather than hasty application of dogmatic assumptions.

Some time after they were made Galton added to them the idea that at some future time some suitable authority might be established to issue eugenic certificates to candidates excelling in physique and in mental capacity. But for the practical application of eugenic doctrine Galton relied far more on the development of social traditions in their favor than upon the enactment of positive law. The more enthusiastic eugenists have by no means been as conservative as was Galton. For example, more than one writer has advocated rather extensive sterilization of criminals. Others have demanded that various restrictions, supposed to safeguard the character of progeny, be incorporated into marriage laws. Experiments along these lines have even been attempted in various commonwealths of the United States. The most effective application of eugenic principles thus far, however, has been the segregation of the feeble-minded. No one can read the ancestral history of some of the inmates of the Training School for Feeble-minded Boys and Girls at Vineland, N. J., as given in Director Goddard's *The Kallikak Family*, without being impressed by the frequency with which feeble-mindedness has appeared in certain family lines. After perusal the reader is likely to agree definitely with Dr. Goddard that "feeble-mindedness is hereditary and is transmitted as surely as is any other character. We cannot successfully cope with these conditions until we recognize feeble-mindedness and its hereditary nature, recognize it early and take care of it." Usually feeble-minded persons are themselves far happier properly segregated and given suitable training than if left at large in society to add abnormal progeny to the population, and there is likely to be little opposition, except that based on financial grounds, to projects for their care. The proposition to incorporate eugenic measures in marriage laws is far more likely to meet with determined opposition on the ground of improper interference with individual liberty. Thus, the practical application of eugenic doctrine is more likely to proceed along the lines of Galton's suggestions. The foundation of the research laboratories already mentioned and the establishment of various journals such as the *Eugenic Review* and Ploetz's *Archiv für Rassen- und Gesellschafts Biologie* for discussion of eugenic topics and the dissemination of knowledge is quite in keeping with those suggestions. In the judgment of those who are best acquainted with the extent of present scientific knowledge of the principles upon which eugenics rests, however, the time has not yet come for radical action. The betterment of the race by means of better breeding must, in the nature of the case, progress *pari passu* with the extension of biological knowledge. Only when the biologist has solved the problems of heredity may the eugenist speak with authority.

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EUGÉNIE-MARIE DE MONTIJO, ẽzhā'nē' mȧ'rē' de môn-tē'hō (1826–1920). Ex-Empress of the French, wife of Napoleon III. She was born at Granada, in Spain, May 5, 1826, the second daughter of the Count of Montijo and Maria Manuela Fitzpatrick, whose father had been United States Consul at Malaga and was a Scotchman by birth and an American by residence. Eugénie was educated at the convent of the Sacré Cœur, near Paris, and after the age of eight lived with her mother and sister in Paris. They moved in French society, though not in the most exclusive circles. Eugénie appeared in society in Paris in 1851 and fascinated every one by her beauty and amiability, Louis Napoleon, who had just been crowned Emperor, not excepted. He conceived an ardent passion for Mademoiselle de Montijo—or the Comtesse de Teba, as she was known—and after the failure of his attempt to enter the circle of European royalty through a dynastic marriage, he decided upon a marriage of inclination, offered himself to Eugénie de Montijo, and was accepted—a dénouement that was viewed by her enemies as the coup of a successful adventuress paralleling Napoleon's own *coup d'état*. The marriage took place with great pomp at Notre Dame on Jan. 30, 1853, and Eugénie was installed as Empress at the Tuileries. The birth of a son, the Prince Imperial, in 1856 served to strengthen Napoleon's hold upon his position. The frivolous nature of Eugénie and the ambition of Napoleon for a brilliant court made the Tuileries the model for luxury and extravagance in Europe. But Eugénie was the arbiter, not only of fashion, but of politics, in spite of the intervals when public policy forced Napoleon to escape from her tutelage. Her Spanish traditions had imbued her with a distrust for democracy and a devotion to the church which dictated entirely the direction of her political influence and that of a powerful group which surrounded her. Napoleon's personal convictions were more liberal, but policy as well as the influence of the Empress dictated to him an indulgent attitude towards the church. Eugénie was deficient, however, in political sagacity and failed in most of her political ventures. She favored the unfortunate Mexican expedition of Maximilian and blocked Napoleon's plans for the liberation of Italy so successfully that he was left without the confidence of either clericals or Italians. She discouraged all concessions to the democratic tide of opinion that had been swelling during the Empire and thus helped to increase the force of the Liberal opposition. Finally, in 1870, with the idea that a successful war would strengthen the dynastic prospects of her son, she made her supreme political mistake in urging Napoleon into the fatal conflict with Prussia, and, as regent during his absence in the war, she was unable to do anything to retrieve the position and fled to England as a simple traveler. She was joined there by Napoleon after his release and the downfall of the Empire, and after his death in 1873 devoted herself to the education of the Prince Imperial. Her hopes for his future were blasted by his death in Africa in the Zulu War in 1879. Thereafter she continued to reside in England in strict retirement at Chislehurst.

Eugénie has been the subject of numerous biographies and memoirs, among them being those of De Lano, *The Empress Eugénie* (London, 1894); Bouchat, *Les élégances du second empire* (Paris, 1896); Saint-Armand, *Louis Napoleon and Mlle. de Montijo* (Eng. trans. by E. G. Martin, New York, 1897); Tschudi, *Eugénie, Empress of the French* (trans. from the Norwegian by E. M. Cope, London, 1899);

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EUGE'NIUS. The name of four popes.—1. Eugenius I, Saint. Pope from 654 to 657. He was elected from the Roman clergy in a time of strife between the East and the West over questions of doctrine and showed a spirit of compromise. He was charitable and gentle and is reckoned as a saint.—2. Eugenius II. A Roman Pope from 824 to 827. The important event of his pontificate was the adoption of the *Constitutio Romana* (824), which provided that the choice of Pope should be taken from the common people and given to the clergy and nobles, his consecration, however, to be dependent on confirmation by the Emperor and an oath of homage from the newly chosen pontiff.—3. Eugenius III, Blessed. Pope from 1145 to 1153. A disciple of Bernard of Clairvaux. During his pontificate occurred the Second Crusade (1147–1149), which he proclaimed and Bernard preached. He was three times driven from Rome by the Republican party of Arnold of Brescia.—4. Eugenius IV. A Venetian, Pope from 1431 to 1447. His pontificate was a season of discord, owing to the proceedings of the Council of Basel and the attacks of enemies at Rome. The Council of Basel was convoked by his predecessor, Martin V, and showed a strong tendency to insubordination. In 1434 Eugenius was compelled to flee from Rome and remained a refugee at Florence till 1443. In 1436 he attempted to dissolve the council, and in 1438 opened a new council at Ferrara and issued a bull of excommunication against the bishops assembled at Basel. The latter deposed him and set up an antipope, Felix V (1439). At the Council of Florence, which succeeded that of Ferrara (q.v.), and at which the Greek Emperor, John Paleologus II, and upward of 20 Greek bishops were present, a union was proclaimed between the Latin and Greek churches (July, 1439). The efforts of Eugenius also met with some success in effecting a temporary reconciliation with the Armenian, Jacobite, and Nestorian churches. In the midst of his troubles he fostered a crusade, which set out in 1443, only to meet disaster. He died at Rome, Feb. 23, 1447. See Basel, Council of; Ferrara-Florence, Council of. Consult Pastor, *History of the Popes* (London, 1906–12).

EUGIP'PIUS, or **EUGYPPIUS** (c.450–?). An Italian monk, abbot of Lucullanum, near Naples. He was born at Carthage, and after studying at Rome became the pupil of St. Severin at Fariana in Noricum. He wrote *Vita Sancti Severini* (511 A.D.), an important contribution to the church history of Germany, and compiled *Thesaurus Augustinianeus*, a collection of excerpts from the works of St. Augustine. There is a monastic rule which is ascribed to Eugippius, but it was superseded by that of St. Benedict. Consult the edition of the former work by Knoell, vol. ix of the *Corpus Scriptorum Ecclesiasticorum Latinorum* (Vienna, 1885–86).

EUGNATHUS, ûg-nā'thŭs (Neo-Lat., from Gk. *εὖ*, *eu*, well + *γνάθος*, *gnathos*, jaw). One of the precursors of the mudfish (*Amia*), fossil remains of which have been found in the Liassic rocks of England and the Jurassic rocks of Bavaria. The body was elongated, and covered with ganoid scales, which were strengthened on their inside surfaces with vertical ribs, and many of which were fastened to each other by peg-and-socket joints. There is a dorsal fin, a pair each of pectoral and pelvic fins, an anal fin, and a semiheterocercal tail fin.

EU'GUBINE TABLES (Lat., *Tabulæ Eugubinæ*). The name given to seven bronze tablets, the inscriptions on which present a comprehensive and very remarkable memorial of the Umbrian language. (See Umbria.) They were discovered in 1444 at Gubbio (the ancient Iguvium or Euguvium, mediæval Eugubium), where they are still preserved, having been bought by the town. The characters on four of the tablets are Umbrian, on two Latin, and on one partly Latin and partly Umbrian. The language resembles somewhat the older forms of the latter and also the Oscan dialects. The subjects of the inscriptions are directions concerning sacrificial usages and forms of prayer, and they seem to belong to two periods—those in Umbrian characters to the second century B.C. and those in Latin letters to the time of Sulla. Philip Buonarotti first published them in a complete form in Dempster's *Etruria Regalis* (Florence, 1723–24). The real decipherment of the inscriptions was due to Karl Ottfried Müller in his *Die Etrusker* (Breslau, 1828) and Grotefend, and the final corrections and improvements were made by Bücheler (q.v.) and Lepsius in *De Tabulis Eugubinis* (Berlin, 1833), and his text (1841). A good work on the inscriptions is Bréal, *Les tables eugubines* (Paris, 1875–78). Consult also: Newman, *The Iguvine Tables* (London, 1864); Bücheler, *Umbrica* (Bonn, 1883); Von Planta, *Oskisch-umbrische Grammatik* (Strassburg, 1892–97); Buck, *Grammar of Oscan and Umbrian* (Boston, 1904); Conway, *Italic Dialects* (Cambridge, 1897). See Italic Languages; Latin Language.

EUGUVIUM. See Gubbio.

EUHE'MERISM. The name usually applied to the theory which seeks to explain all mythology as distorted history. The name is derived from Euhemerus (*Εὐήμερος*) of Messana in Sicily, who was a contemporary and friend of Cassander of Macedon (311–298 B.C.). Sent by the King on a voyage to the south, he utilized his travels to bring his theory before the world. In his Sacred Record (Gk. *Ἱερὰ Ἀναγραφή*) he described the habits and the government found on an (imaginary) island, Panchæa, in the Indian Ocean. This enabled him to set forth his view of an ideal state. He endeavored to show that the Greek gods were merely men, who had been deified because of their power or services to mankind. He was not the first to suggest this interpretation, as it had already been applied by such writers as Hecatæus and Ephorus to various myths of the heroes connected with early Grecian history; but he carried it far beyond any previous writer in the universality of its application even to the gods. Naturally, and probably with full justice, the book brought upon its author the name of Atheist, though, considering its obviously fictitious character, it is hard to see why he should have been branded as a deceiver. Ennius translated Euhemerus' book. Many of the later writers adopted his views, and to many of the early Christian apologists his work was a welcome storehouse of material for use in their attacks upon the heathen divinities. The theory has had defenders from the days of its founder to the present time. In the eighteenth century it was made prominent by Banier's *La mythologie et les fables expliquées par l'histoire* (Paris, 1738), and with some admixture of the allegorizing tendency is found in those writers who endeavored to interpret Greek legends as a derivation from the biblical narrative, as in the *Arca Noæ* of Athanasius Kircher and others—a method which survived long, and is found even in 1893 in the *Revue d'exégèse mythologique* of the Abbé Fourier. Some elements of euhemerism may also be attributed to those theories which see the origin of all mythologies, and even all religious emotions, in the worship of ancestors and spirits of the dead. Consult: Sieroka, *De Euhemero* (Königsberg, 1868); Némethy, *Euhemeri Relliquiæ* (Budapest, 1889); Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit*, vol. i (Leipzig, 1891); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii (5th ed., Munich, 1911).

EUHE′MERUS. See Euhemerism.

EULACHON, ū′lȧ-kŏn, or **OOL′ACHAN.** See Candlefish.

EULA′LIUS. Antipope chosen in opposition to Boniface I (q.v.) (418). The dispute occasioned the first interference on the part of the temporal authorities in the choice of a pope. The party of Boniface prevailed, and Eulalius left Rome and later resigned all pretensions.

EULENBERG, oi′len-bĕrk, Hermann (1814–1902). A German physician. He was born at Mühlheim-on-the-Rhine and studied at Bonn and Berlin. At Coblenz he founded the publication entitled *Korrespondenzblatt der deutschen Gesellschaft für Psychiatrie und gerichtliche Medizin* and made investigations in regard to the prevalence of cretinism and goitre in the District of Coblenz (*Beiträge zur pathologischen Anatomie des Kretinismus*, in collaboration with Marfels, 1857). He subsequently became government counselor and medical counselor at Cologne (1860–70) and was in 1870 appointed counselor to the Ministry of Education (1870–87). From 1870 to 1890 he edited the *Vierteljahrsschrift für gerichtliche Medizin und öffentliches Sanitätswesen.* His principal works, which deal mainly with public hygiene, are the following: *Das Medizinalwesen in Preussen* (1874); *Handbuch der Gewerbehygiene* (1876); *Handbuch des öffentlichen Gesundheitswesens* (in collaboration with other specialists, 2 vols., 1881–82); *Schulgesundheitslehre* (with Bach, 2d ed., 1896).

EULENBURG, oi′len-bŭrk, Albert (1840–). A German physician, born in Berlin and educated at the universities of Berlin and Bonn. As assistant in the University Hospital at Greifswald, he published in 1864 the important treatise entitled *Die hypodermatische Injection der Arzneimittel* (3d ed., 1875), for which he received the prize awarded by the Hufeland Society of Berlin. In 1874 he was appointed professor of therapeutics and director of the Pharmacological Institute at Greifswald. He returned to Berlin in 1882 and devoted himself to researches in neuropathology, on which subject he was soon a recognized authority. Besides publishing the important works entitled *Sexuale Neuropathie* (1895) and *Lehrbuch der Nervenkrankheiten* (2d ed., 1878), he became editor of the *Real-Encyklopädie der gesamten Heilkunde* (3d ed., 1893 et seq.). He was also editor of the *Encyklopädische Jahrbücher der gesamten Heilkunde* (1891 et seq.), and, in collaboration with J. Schwabe, of the *Deutsche medizinische Wochenschrift.*

EULENBURG, Botho, Count (1831–1912). A German statesman, a son of the Prussian statesman Count Botho Heinrich Eulenburg (1804–79). After studying law and holding a position as government counselor, he was a member of the Prussian Lower House in 1865–70 and was elected to the North German Reichstag as a Conservative in 1867. In 1878, as Minister of the Interior, he formulated the Socialist law of October and vigorously prosecuted the work of administrative reform. Differences arose between him and Bismarck over what the Chancellor thought to be undue leniency, and he was compelled to resign in 1881. After the withdrawal of the Chancellor, Count Caprivi, from the Prussian Premiership in 1892, Eulenburg succeeded as President of the Ministry and in the same year became Minister of the Interior. But his advocacy of strenuous measures against the social democracy was disapproved by Chancellor Caprivi, and the differences arising between the two men, especially on an amendment to the criminal code, resulted in the dismissal of both, Oct. 26, 1894. Eulenburg took his seat in the Prussian House of Lords in 1899.

EULENBURG, Friedrich Albrecht, Count (1815–81). A German statesman. He was an assistant in the Department of the Interior from 1849 to 1852 and then was appointed Consul General at Antwerp and (1858) at Warsaw. In October, 1859, as head of the Eastern Asiatic expedition of the Prussian government, he conducted negotiations leading to commercial and maritime treaties with China and Japan, which were ratified on Jan. 24 and Sept. 2, 1861, respectively. Upon his return he was appointed by Bismarck Minister of the Interior (Dec. 8, 1862). After 1866 he energetically organized the administration of the newly acquired provinces of Prussia, consistently following a Conservative policy until 1878, when certain concessions which he had made to the Liberal party were opposed by Bismarck and led to his resignation, March 30, 1878. His speeches and papers were published under the title *Zehn Jahre innere Politik, 1862–72* (Berlin, 1872), and Prince Philipp Eulenburg edited his *Ostasien 1860–1862 in Briefen* (ib., 1900).

EULENBURG, Philipp, Prince (1847–1921). A German diplomat, born at Königsberg, Prussia. He served in the wars with Austria and France and studied law at Leipzig and Strassburg from 1872 to 1875. He was Prussian Ambassador to Oldenburg from 1888 to 1890; at Stuttgart (1890), Munich (1891), and German Ambassador to Vienna from 1894 to 1902, when his poor health forced him to leave the diplomatic service. In 1900 he was raised in rank from Graf to Fürst; Hertefeld was added to his title of Eulenburg; and he was made a hereditary member of the House of Lords. The attacks of Harden in the *Zukunft* in 1907 on the Imperial court and its intrigues were as unfortunate for Prince Eulenburg as for Kuno Moltke and other intimates of the Emperor. He wrote: *Rosen-*

lieder (1886; 152d printing, 1903); *Skaldengesänge* (1892); *Dichtungen* (1892); *Das Weihnachtsbuch* (1892); *Erich und Erika und andere Erzählungen für Kinder* (1893); *Abenderzählungen, Märchen und Träume* (1894).

EULENSPIEGEL, oi'len-shpē̆'gel, Till or Tyll (Ger., owlmirror). A German of clownish wit, said to have lived in the first half of the fourteenth century, whose clumsy and vulgar account of his own pranks made his life the gathering point of popular tales of mischief. A Low Saxon account of his pranks was written in 1483 and printed in 1519 in a High German version, by some attributed to Thomas Murner. It has often been edited, best by Lappenberg (1854). It was soon rendered into Czech, Polish, Italian, Danish, French, Latin, and into English under the title *Howle-Glass.* It has been adapted for modern German readers by Simrock (1878). Its universal popularity is a striking witness to the general debased taste that prevailed at this period. It was afterward adapted by both Reformers and Catholics to their purposes. Fischart issued a metrical version in 1571. Modern imitations are: Böttger, *Till Eulenspiegel: Modernes Heldengedicht* (1850); Wolff, *Till Eulenspiegel Redivivus: ein Schelmenlied* (1875). A modern English edition, elaborately illustrated, appeared in 1860, and a translation by Mackenzie in 1890. Consult Roscoe, *German Novelists* (London, 1880), or any good history of German literature.

EULER, oi'lẽr, Leonhard (1707–83). A Swiss mathematician, one of the most remarkable of his century. He was born at Basel. Euler was sent to the University of Basel so early and was so proficient in his work that he received the master's degree at the age of 16. He studied mathematics under Johann Bernoulli at Basel and also studied theology, the Oriental languages, and medicine. In the course of his physiological researches he wrote a treatise on the nature and propagation of sound and also wrote an essay on the masting of ships, which received a prize of the French Academy of Sciences in 1727. In that year Euler went to St. Petersburg upon the invitation of Catharine I and became an associate of the Academy of Sciences. In 1730 he was made professor of physics and in 1733 professor of higher mathematics. In 1740 he became inspector of the geographical department and in the following year was called to Berlin by Frederick II to take the chair of mathematics in the Academy of Sciences, from which he was not long afterward advanced to the position of director of the mathematical class. In 1766 he was called back to St. Petersburg, where he remained until his death. Euler lost one eye as the result of a severe illness in 1735, and soon after his return to Russia in 1766 he lost the use of the other. This did not, however, hinder his mental activity, and he contributed extensively to the science of mathematics until the day of his death.

The number no less than the value of Euler's mathematical writings was very great. He wrote, aside from his separate treatises, 473 memoirs published during his life, 200 published soon after his death, and 61 others of which the publication was undertaken by P. H. and N. Fuss in 1849. Of his more important treatises, the following may be mentioned: *Mechanica sive Motus Scientia Analytice Exposita* (1736; 2d ed., 1742); *Tentamen Novæ Theoriæ Musicæ* (1739); *Einleitung in die Arithmetik* (1742); *Methodus Inveniendi Lineas Curvas Maximi Minimive Proprietate Gaudentes* (1744); *Theoria Motuum Planetarum et Cometarum* (1744; Ger. ed., 1781); *Opuscula Varii Argumenti* (3 vols., 1746–51); *Gedanken von den Elementen der Körper* (1746); *Lettres à une princesse d'Allemagne sur quelques sujets de physique et de philosophie* (1768–72; 2d ed. by Cournot, 1842; Ger. ed., Stuttgart, 1853; Eng. ed., New York, 1833). His textbooks were relatively less important; they include the following: *Introductio in Analysin Infinitorum* (1748; Fr. ed., 1796–97; Ger. ed., 1785–90); *Institutiones Calculi Differentialis* (1755; 2d ed., 1804; Ger. ed., 1790–98); *Institutiones Calculi Integralis* (3 vols., 1768–70; 3d ed., 4 vols., 1824–45; Ger. ed., 4 vols., 1828–40); *Anleitung zur Algebra* (1771; 3d ed., 1821; Fr. ed., 1770, 2d ed. 1795, and Paris, 1807; Eng. ed., 1818, 2d ed. 1821); *Dioptrica* (3 vols., 1769–71); *Theoria Motuum Lunæ Nova Methodo Pertractata* (1772); *Opuscula Analytica* (1783–85). For biography of Euler, consult: Condorcet, *Eloge, in* Euler's *Institutiones Calculi Differentialis* and in his *Lettres à une princesse d'Allemagne;* also Fuss, *Correspondance mathématique et physique* (St. Petersburg, 1843).

EUMÆ'US (Lat., from Gk. Εὔμαιος, *Eumaios*). The faithful swineherd in the *Odyssey*, xv, who recognizes Odysseus on his return and aids him in destroying the suitors. See Ulysses.

EUMATHIUS. See Eustathius.

EUMENES, ū'mê-nēz (Lat., from Gk. Εὐμένης) (c.360–316 B.C.). A capable general of Alexander the Great, born at Cardia in the Thracian Chersonesus. He was private secretary of Philip of Macedon and, after Philip's death, of Alexander, under whom he was also commander of the cavalry. On the death of Alexander, Eumenes became Governor of Cappadocia, Paphlagonia, and the seacoast of Pontus as far as Trapezus. With Perdiccas as an ally, he defeated Craterus, Neoptolemus, and Antipater in 321 B.C. In the next year he was himself defeated by Antigonus and retreated to Nora, on the borders of Lycaonia and Cappadocia, where he withstood a long blockade (320–319 B.C.). He was finally betrayed by his soldiers into the hands of Antigonus, by whose orders he was put to death (316 B.C.). With the death of Eumenes there came to an end the last effort to hold together the Macedonian Empire for the rightful heirs of Alexander the Great. His life was written by Cornelius Nepos and by Plutarch. Consult Vezin, *Eumenes von Kardia: ein Beitrag, zur Geschichte der Diadochenzeit* (Münster, 1907).

EUMENES II (?–159 B.C.). King of Pergamum (q.v.), and a son of Attalus I. He began his reign in 197 B.C. and was a faithful ally of the Romans in their war against Antiochus (q.v.) the Great. He contributed largely to the victory at Magnesia (190 B.C.) and received, in recognition of his services, the provinces of Mysia, Lydia, and Phrygia, so that he became one of the most powerful rulers in Asia. By his political sagacity in continuing friendly to Rome he greatly increased the political prestige of his realm, and his rule was marked by peace and prosperity. He was a liberal patron of the arts and sciences and attracted many scholars to his court. He completed the magnificent altar at Pergamum (q.v.), and established a library which is said to have rivaled that of Alexandria. (See Libraries.) He ruled until 159 B.C. and was succeeded by his brother, Attalus II.

EUMENIDES, ū-mĕn′ĭ-dēz (Lat., from Gk. *Εὐμενίδες*, the gracious ones, from *εὖ*, *eu*, well + *μένος*, *menos*, mind). The euphemistic name of the Erinyes. Their Latin name was *Furiæ* or *Diræ*. Mentioned by the earliest Greek poets, they play a prominent part in the writings of the tragedians. They are representatives of the mighty powers who punish those who offend against the unwritten laws of conduct. Their home is in the lower world, but their power extends into this life, and they hunt the sinner to his ruin. In the epic they punish perjury, homicide, and such sins in the household as neglect of parents and ill treatment of guests. In the tragedies there are indications of a more general conception of them as guardians of the universal laws. They either take vengeance on the living or carry off the sinner to the lower world, where others can punish him. They are also the torturers of sinners in the other world. As pursuers of criminals, they are represented in the short tunic and boots of the huntress or accompanied by hounds; as avengers, they bear whips or burning torches; while the snake of chthonic divinities appears in their hair or is carried in their hands. At first their number is not mentioned; Homer once uses the singular, and a Demeter Erinys was worshiped at Thelpusa in Arcadia. Æschylus brought 15 on the stage in the *Eumenides*, but in Euripides the number is three, and later learning gave them the names Alecto, Megæra, Tisiphone. Their genealogy also was uncertain. Hesiod calls them daughters of Gæa; Æschylus makes them daughters of Night. Such dread deities, however, are terrible only to the sinner; to the devout worshiper they are bringers of blessing and protection, and hence are rightly called Eumenides, or at Athens *Σεμναί*, 'The Revered.' They were honored at Sicyon, Argos, and elsewhere, but we are best informed about Athens, where they had a sanctuary near a cave on the east side of the Areopagus, and a sacred inclosure at Colonus. Consult: Æschylus, *Eumenides; Sophocles, Œdipus at Colonus;* Fairbanks, *A Handbook of Greek Religion* (New York, 1910).

EUME′NIUS (c.260–311 A.D.). One of the Roman panegyrists (q.v.), born at Augustodunum (modern Autun) in Gallia Lugdunensis. After teaching rhetoric at Augustodunum, he went with Constantius Chlorus on several campaigns as his secretary. In 296, when Chlorus resolved to restore the famous schools of Autun, he appointed Eumenius to manage them. In 297 Eumenius delivered at Autun, in the forum, an address *Pro Restaurandis Scholis*, in which he unfolded the steps necessary to restore the efficiency of the schools. Out of 12 speeches included in Baehrens's *Panegyrici Latini* (Leipzig, 1874), 4 have been attributed to Eumenius: the speech named above; an address to Constantius Chlorus, then Cæsar, congratulating him on his victories over Allectus and Carausius in Britain (297 A.D.); a panegyric on Constantine (310); and an address on the marriage of Constantine and Fausta. Consult Teuffel, *Geschichte der römischen Litteratur*, vol. iii (6th ed., Leipzig, 1913).

EUMOL′PIDÆ. See EUMOLPUS.

EUMOL′PUS (Lat., from Gk. Εὔμολπος, *Eumolpos*, the sweet singer, from *εὖ*, *eu*, well + *μολπή*, *molpē*, song, from *μέλπειν*, *melpein*, to sing). In the later mythology of Greece, the son of Poseidon and Chione, daughter of Boreas and Oreithyia. He was brought up in Ethiopia, whence he went to Thrace, and afterward passed into Attica at the head of a body of Thracians, to assist the Eleusinians (who had once shown him hospitality) in their war against Erechtheus (q.v.), King of Athens. Eumolpus fell in the battle, and later the Eleusinians submitted to the Athenians, only reserving to themselves the celebration of the mysteries. Eumolpus also appears as King of Eleusis, and it is to him that Demeter communicates the mysteries. To him the hereditary priests of the goddess at Eleusis, the *Eumolpidæ*, traced their descent. (See ELEUSINIAN MYSTERIES; ELEUSIS.) Other legends made him a musician and connected him with the mythical Thracian bard, Musæus (q.v.), as his pupil, his son, or even his father. To endeavor to harmonize the many contradictory stories about Eumolpus, some of the later mythographers distinguished three persons of this name.

EUMYCETES, ū′mĭ-sē′tēz. A name of convenience given to the Ascomycetes and Basidiomycetes as distinguished from the Phycomycetes. The name indicates that the first two groups are to be regarded as the true fungi, and the last named as a group of fungi with algal characters. See FUNGI.

EUNA′PIUS (Lat., from Gk. **Εὐνάπιος**) (c.346–?). A Greek sophist and historian, born at Sardis. He was a Neoplatonist, a believer in the old religion, and a bitter enemy of Christianity. In his youth he was a pupil of the Neoplatonist Chrysanthius. From 362 to 366 A.D. he was a student at Athens, in the school of Proæresius. In 366 he returned to his native town and there set up a school for himself. His death occurred not earlier than 414 A.D. He wrote at the beginning of the fifth century a work entitled *Lives of the Philosophers and the Sophists*, containing 23 biographies of representative Neoplatonists and Sophists; this was edited by Boissonade (Paris, 1849). This work is preserved. He was also the author of a contemporary history in 40 books, designed to be a continuation of the history of Dexippus. It included the years from 270 to 404 A.D. We have only fragments of this history, to be found in Müller, *Fragmenta Historicorum Græcorum*, vol. iv (5 vols., Paris, 1841–73), but its substance is incorporated in the work of Zosimus.

EU′NICE (Lat., from Gk. *Εὐνίκη*, *Eunikē*). A Jewess of Lystra, mentioned in the New Testament (Acts xvi. 1; 2 Tim. i. 5) as the mother of Timothy. Her husband was a Greek (Acts xvi. 1), in deference to whom probably she allowed their son to remain uncircumcised (Acts xvi. 3). But she had given him a religious name (*Timotheus*, honoring God) and had faithfully trained him from early years in the Jewish Scriptures. (2 Tim. iii. 15). As she is referred to at the beginning of Paul's second missionary tour as a believer, it is likely that she was one of the converts of his first missionary work. See TIMOTHY.

EUNO′MIUS (Lat., from Gk. Εὐνόμιος) (?–c.392). The founder of the once numerous Arian sect of Eunomians, which disappeared in the fifth century. He was born in the village of Dacora in Cappadocia and was first a lawyer, then a soldier, and ultimately took holy orders. In 360 he was appointed Bishop of Cyzicus and held his see till 364. In the great controversy regarding the nature of the Trinity which raged during the fourth century, Eunomius was conspicuous by his advocacy of the extreme Arian view that the Father alone was eternal and supreme; that the Son was generated of Him; and the Holy Spirit, again, of the Son. His doctrine of the Trinity is sometimes called the *anomoian*, 'dissimilar,' to distinguish it, on the one hand, from the *homoiousian*, 'similar,' held by the semi-Arians, and, on the other, from the *homoousian*, 'identical,' held by the Athanasian or Trinitarian party. (See HOMOOUSION.) His life was much checkered. His doctrines were approved by synods at Antioch in 358 and 362, but condemned at other synods. He was banished from one place to another, until at length he obtained permission to retire to his native village, where he died about 392. His writings are preserved only as fragments here and there in the works of his adversaries. They are published in Migne, *Patrologia*, cxv, and an English translation of the first *Apology* in Whiston, *Eunomianismus Redivivus.* Consult Klose, *Geschichte und Lehre des Eunomius* (Kiel, 1833), and Harnack, *History of Dogma* (Boston, 1894–1900).

EUNUCH, ū'nŭk (Lat. *eunuchus*, Gk. *εὐνοῦχος*, from *εὐνή*, *eunē*, bed + *ἔχειν*, *echein*, to have). In general, a castrated man; specifically, such a man employed as keeper of a harem or in a priestly capacity. Eunuchism is of prehistoric origin and prevails in some form or other among nearly all races and peoples.

EUNUCHUS, ū-nŭk'ŭs (Lat., Eunuch). One of the brightest and most successful comedies of Terence, derived from the *Eunuchus* and the *Kolax* of Menander. It was produced in 161 B.C. It suggested Sir Charles Sedley's *Bellamira*, Brueys's *Le Muet*, and La Fontaine's *L'Eunuque*.

EUOM'PHALUS. A fossil gastropod with wide, depressed, spiral shell. Many species are known from rocks of Silurian to Triassic age, but they are most common in those of the Carboniferous period, especially in Europe. Allied genera of importance are *Ophileta* and *Maclurea* (qq.v.) of Ordovician age.

EUON'YMUS. See SPINDLE TREE.

EUOR'NITHES (Neo-Lat. nom. pl., from Gk. *εὖ*, *eu*, well + *ὄρνις*, *ornis*, bird). A prime division of birds, embracing all except the Archæopteryx (q.v.), which is hence regarded as a representative of another and very different ancient structural type of birds, the Archæornithes. Equivalent terms are Neornithes and Eurhipiduræ, the latter meaning "fan-tailed" (euornithic) as opposed to the arch-ornithic Sauruгæ, or "lizard-tailed" type.

EUPALI'NUS, OF MEGARA. A Greek architect, builder of a famous aqueduct on the island of Samos for Polycrates. This aqueduct, or tunnel through a hill, still exists. (See AQUEDUCT.) Consult the article "Emissarium," in Smith, *A Dictionary of Greek and Roman Antiquities* (3d ed., London, 1890).

EU'PATO'RIA. A seaport and district town in the Russian Government of Taurida, situated on the west coast of the Crimea, 38 miles northwest of Simferopol (Map: Russia, D 5). Its harbor, an inlet of the Black Sea, is unprotected, but free from ice the entire year. The city is picturesque in appearance, having an Oriental character. Among its mosques the most noteworthy is that built by Devlet-Ghiri Khan in 1552, modeled after St. Sophia of Constantinople. There are a number of Tatar high schools, synagogues, Turkish baths, etc. The town has tanneries, soap and candle factories, and there is a considerable trade in grain, wool, and salt. The salt lake of Saki, on which Eupatoria is situated, is one of the best-frequented bathing resorts in the Crimea on account of its mud springs which are credited with curative powers in cases of rheumatism and paralysis. Pop. (1910), 30,432. Eupatoria was an important place under the Tatars. With its annexation to Russia in 1783 it received its present name from an old fort constructed about 100 B.C. in the reign of Mithridates Eupator. A portion of the allied Anglo-French forces held the town for four days, Sept. 14–18, 1854. The town was also the scene of a battle between the Russians and the Turks on Feb. 17, 1855, in which the latter were victorious.

EU'PATO'RIUM (Lat. *eupatoria*, Gk. *εὐπατόριον*, *eupatorion*, the plant hemp agrimony; named in honor of Mithridates Eupator). A genus of plants of the family Compositæ, having small flower heads in corymbs, with the florets all tubular. The species, about 400 in number, are mostly American, a few occurring in Europe and Asia. One only is British, the common hemp agrimony (*Eupatorium cannabinum*), a slightly aromatic perennial plant, growing mostly in marshy places and on the banks of streams. The root was formerly employed as a purgative, and the plant was also used as a diuretic and as a vulnerary. Thoroughwort, or boneset (*Eupatorium perfoliatum*), a species having the opposite leaves joined at the base, is very common in low grounds in North America and is a popular medicine often administered in intermittent fevers, also as an emetic and purgative and, in small doses, as a tonic. It contains eupatorin (a bitter glucoside), a volatile oil, tannin, etc. The whole plant is very bitter. Other North American species possess similar properties, and the root of one, known as gravelroot, or joe-pye weed (*Eupatorium purpureum*), is employed as a diuretic for the relief of the disease from which it derives its name. The ayapana (*Eupatorium triplinerve*), a half-shrubby species, native of the north of Brazil, has a high reputation in that country as a cure for snake bites and has been introduced into the East Indies. It is a very powerful sudorific and is also diuretic. The Peruvian vulnerary, matico, has been referred, but uncertainly, to a shrubby species of this genus (*Eupatorium glutinosum*). Guaco, or huaco, reputed in Peru as a cure for snake bites, is supposed to belong to the allied genus *Mikania*. For illustration, see Plates of BONESET, GOLDENROD, and BAMBOO.

EUPAT'RIDÆ (Lat., from Gk. *εὐπατρίδαι*, *eupatridai*, nom. pl. of *εὐπατρίδης*, *eupatridēs*, having a noble father, from *εὖ*, *eu*, well + *πατήρ*, *patēr*, father). The old aristocracy of birth in Athens, dwellers in the city itself. (See ATHENS, *History*.) At first they alone held the full citizenship, constituted the governing class, and had exclusive political rights and priestly functions, of which they were deprived by the constitution of Solon. (See ARCHON; AREOPAGUS.) Their influence was, however, long preserved by their territorial possessions. Consult Gilbert, *The Constitutional Antiquities of Sparta and Athens* (Eng. trans., London, 1895).

EUPEN, oi'pen. A town of the Prussian Rhine Province, situated in a beautiful valley, within 2 miles of the Belgian frontier and about 10 miles south of Aix-la-Chapelle (Map: Prussia, B 3). Eupen is known for its extensive woolen and cloth mills, manufactures paper, machinery, soap, felt, and has iron foundries, tanneries, dye works, stone quarries, and breweries. Pop., 1900, 14,294; 1905, 13,600; 1910, 13,544.

EU'PHEMISM (Gk. *εὐφημισμός*, *euphēmismos*, from *εὐφημίζειν*, *euphēmizein*, to speak auspiciously, from *εὔφημος*, *euphēmos*, auspicious, from *εὖ*, *eu*, well + *φήμη*, *phēmē*, voice, from *φάναι*, *phanai*, to speak). A figure of rhetoric by which an unpleasant or offensive matter is designated in indirect and milder terms. Thus, instead of directly calling up an unpleasant image by the word *died*, we say, "He was gathered to his fathers," and even the malicious elves and fairies of modern superstition are spoken of as "good people." See ANTIPHRASIS.

EU'PHOR'BIA. See SPURGE; EUPHORBIACEÆ.

EU'PHOR'BIA'CEÆ (Neo-Lat. nom. pl., from Lat. *euphorbeum*, *euphorbea*, Gk. *εὐφόρβιον*, *euphorbion*, the plant spurge; named in honor of Euphorbus, a celebrated Greek physician at the Mauretanian court). A very extensive family of dicotyledonous plants, the "spurge family," containing 220 genera and more than 4000 species—trees, shrubs, and herbs. They abound chiefly in warm countries and most of all in tropical America. The few species found in the colder parts of the world are all herbaceous. The common box reaches a more northern limit than any other shrubby species. The species common to the United States are different kinds of spurge (*Euphorbia*), croton, three-seeded mercury, spurge nettle, and queen's delight. The Euphorbiaceæ usually abound in an acrid and poisonous milky juice, although there are species of which the juice is bland, or becomes bland through the application of heat, so that their leaves may be used as food. The leaves exhibit great diversities. The inflorescence is also various, nearly every type of inflorescence being found. The flowers are always monosporangiate and may be monœcious or diœcious. In some species the perianth consists of one or two whorls, in others it is wholly absent; when present, it is usually five-parted. The stamens are one to many and variously united. The ovary is usually three-lobed, the carpels splitting elastically and throwing the seed to some distance. This is shown well in the drying of castor beans. Among those remarkable for the acridity of their juice are the manchineel (q.v.) and *Excœcaria agallocha*, an East Indian tree, formerly supposed to yield one of the kinds of aloes wood, the smoke from the burning of which is extremely irritating to the eyes. The juice of many of the spurges is also very acrid. Many of the Euphorbiaceæ are valued for their medicinal properties, different parts of the plant being in some instances employed, and in some the resin and oils which they contain. Many of them yield valuable products—rubber, cassava, castor oil, croton oil, euphorbia oil, candlenut, cascarilla, African teak, etc. (See HEVEA; MANIHOT.) Others, such as *Croton* and *Codiœum*, are often cultivated in gardens and hothouses, more frequently for their curious appearance than for their beauty; but the large scarlet bracts of *Euphorbia pulcherrima*, a native of Mexico, are very attractive. See Plate of EDELWEISS.

EUPHOR'BIUM. A gum resin. See GUMS.

EUPHOR'BUS (Lat., from Gk. Εὔφορβος). One of the bravest of the Trojan warriors, the son of Panthoüs and Phrontis. He first wounded Patroclus when the latter was fighting in the armor of Achilles and was slain by Menelaus (*Iliad*, xvii, 1–60). Pythagoras, who held the doctrine of metempsychosis, claimed that his soul had once inhabited the body of Euphorbus; to prove this he picked out, in the temple of Hera at Argos, the shield of Euphorbus. Consult the editors on Horace, *Carmina*, 1, 28, 10–13.

EUPHO'RION (Lat., from Gk. Εὐφορίων) (276–c.200 B.C.). A Greek poet and grammarian. He was born at Chalcis in Eubœa, but studied at Athens, and became librarian to Antiochus the Great about 220 B.C. His works, which included historical and grammatical productions in prose, mythological epics, elegies, and epigrams, were censured by Cicero as affectedly obscure. Among the Romans of the Augustan period, however, he was very popular, and his elegies are said to have been the models for those of Gallus and of the Emperor Tiberius. Fragments of his works are published in Meineke's *De Euphorionis Chalcidensis Vita et Scriptis* (Berlin, 1823) and *Analecta Alexandrina* (Berlin, 1843), and in Kock's *Fragmenta Comicorum Græcorum* (Leipzig, 1880). A new fragment is discussed in *Berliner Klassikertexte*, vol. i (1907). (Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i, 5th ed., Munich, 1911.) The amours of Euphorion with Nicia, the wife of King Alexander of Eubœa, are frequently alluded to in the poems of the *Greek Anthology*.

EUPHRA'NOR (Lat., from Gk. Εὐφράνωρ). A sculptor and painter of Corinth, who lived in the middle of the fourth century B.C. His most celebrated painting was in the Stoa Basileios at Athens. It represented the 12 gods, Theseus with the People, and Democracy, and the charge of the Athenian cavalry at Mantinea (362 B.C.). Among his statues were an Apollo, a Paris, and a Leto, with Apollo and Artemis in her arms, fleeing from the serpent. In his statues he adopted unusually slender forms, in reaction against the solid, heavy figures portrayed by Polyclitus. Furtwängler (*Meisterwerke der griechischen Plastik*, Berlin, 1893) has proposed to identify a number of well-known statues with ancient copies of the works of Euphranor, among them the "Dionysos" from Tivoli and the Athena Giustiniani of the Vatican. Consult E. A. Gardner, *A Handbook of Greek Sculpture* (London, 1911).

EUPHRATES, ū-frā'tēz (Lat., from Gk. Εὐφράτης, OPers. *Ufrātes*, Heb. *Perāth*, Assyr. *Purattu*, Ar. *Furāt*, Turk. *Frāt*, from Sumerian *Pura-mun*, great water). A river of Asia, forming, with its tributary, the Tigris (q.v.), the principal river system of the southwestern part of the continent (Map: Turkey in Asia, E 4). It has its source in the heart of Armenia, in two branches—the Kara Su, or Western Euphrates, and the Murad Su, or Eastern Euphrates, the former rising 25 miles northeast of the town of Erzerum and flowing southwest to a point below Seraijik, where it is met by the Murad Su, which rises on the south slope of Ala-Dagh and flows west-southwest to the point of confluence. From Seraijik the Euphrates flows in a general southerly direction, inclining at first to the east, but later with a tendency westward towards the Mediterranean. In this part of its course it breaks through the Anti-Taurus, and flows among the mountains for 45 miles, emerging at Samsat, whence it continues uninterrupted by rapids to the sea, a distance of 1200 miles. Before reaching Rum Kaleh it changes its direction and, flowing south, separates for some distance Mesopotamia from Syria and the deserts of Syrian Arabia. Curving to the southeast, it flows on without receiving any important tributaries for about 700 miles, until it is joined at Kurna by the Tigris. From Kurna the river takes the name of the Shat-el-Arab, and continues to flow in a southeasterly direction until, after being united by a canal with the Karun from the east, it discharges its waters through several arms into the Persian Gulf, 90 miles below Kurna. The total length of the Euphrates is over 1700 miles, while the area of its basin is estimated at 260,000 square miles.

Notwithstanding its size, the Euphrates is of little commercial importance and has very little influence on the economic life of the region through which it flows. The Armenian highlander to-day, as he did 2000 years ago, floats down the stream on his skin or wood raft to sell his goods and returns on foot to his highland home. It is navigable for light vessels from Babylon to the sea, a distance of about 450 miles, but even the portion below the confluence of the Tigris is not always of sufficient depth for navigation. Aside from the Tigris, the chief tributaries are the Khabur and Nahr Belik from the east; from the west are received the intermittent waters of a number of wadi-like streams. Originally the river emptied directly into the Persian Gulf; the accretions to the soil, due to deposits at the mouth, which, it is estimated, proceed at the rate of one mile in 50 years, have brought about the change and caused it to unite with the Tigris at Kurna.

Historically the Euphrates is second in importance to no river in the world. It flowed west of Assyria and through Babylonia and is closely connected with the early Oriental world empires. In ancient times it carried considerable commerce and travel, being navigated by means of boats of wickerwork smeared with bitumen. The plains along its lower course were intersected by an elaborate system of irrigation canals, and, fertilized by the annual overflow, which takes place from the beginning of March to the end of May, were of great productiveness and supported a teeming population. In the Bible the Euphrates is "*the* river," or "the great river" (cf. Gen. xv. 18; Deut. i. 7). It was one of the four rivers of Eden and the only one mentioned without description (Gen. ii. 14). In the dreams of the Hebrews concerning dominion it represented the eastern limit of their territory (cf. Deut. xi. 24; Josh. i. 4). In exilic times the Hebrews became very familiar with the river, and there are many allusions to it in the prophets, particularly Jeremiah. For centuries the river was the eastern limit of the Roman power, and under the caliphs its banks were lined with prosperous towns, where the arts and literature flourished. Consult: Chesney, *The Expedition for the Survey of the Rivers Euphrates and Tigris* (London, 1850); Peters, *Nippur; or, Explorations and Adventures on the Euphrates* (New York, 1897); E. Sachan, *Am Euphrat und Tigris* (Leipzig, 1900); H. V. Geere, *By Nile and Euphrates* (New York, 1904); Hugo Winckler, *Die Euphrätlander und das Mittelmeer* (Leipzig, 1905). See BABYLONIA.

EUPHRO′NIUS (Lat., from Gk. Εὐφρόνιος). A great Greek vase painter, who worked at Athens at the time of the Persian Wars. Ten vases signed by him are known; they well illustrate the progress of contemporary vase painting. Some are archaic in style and stiff, others show greater freedom from archaic tradition. The themes are varied, and the groupings striking and original. Consult Fowler and Wheeler, *A Handbook of Greek Archæology* (New York, 1909), and P. Gardner, *The Principles of Greek Art* (ib., 1914).

EUPHROSYNE, ū-frŏs′ĭ-nē (Lat., from Gk. Εὐφροσύνη, the personification of joy, from *εὔφρων*, *euphrōn*, joyous, from *εὖ*, *eu*, well + *φρήν*, *phrēn*, mind). One of the three Graces.

EUPHTHALMINE, ūf-thăl′mĭn (from Gk. *εὖ*, *eu*, well + *ὀφθαλμός*, *ophthalmos*, eye). An artificial alkaloid. Its hydrochlorate is used in solution as a substitute for atropine and homatropine for dilating the pupil in examinations with the ophthalmoscope. Although it requires about 30 minutes to produce complete dilatation, it possesses the marked advantage that its effect passes off in five hours or less. Homatropine causes dilatation for 24 to 36 hours and atropine for several days. While effectually dilating the pupil, euphthalmine has little effect upon accommodation and can be used without danger of causing glaucoma (q.v.).

EUPHUES, ū′fū-ēz, or THE ANATOMY OF WIT. A famous romance by John Lyly (1579). It treats of the molding of English society through Italian influences and of the right principles of education. A sequel was published in 1580 under the title *Euphues and his England*.

EU′PHUISM (from Gk. *εὐφυής*, *euphyēs*, clever, from *εὖ*, *eu*, well + *φυή*, *phyē*, nature, from *φύειν*, *phyein*, to produce). A term used in English literature to denote an affected style of language, fashionable for a short period at the court of Queen Elizabeth. The word was formed from the title of the book which brought the style into vogue, the *Euphues* of John Lyly (1579). The style was imitated by Shakespeare in *Love's Labour's Lost*, and caricatured by Scott in *The Monastery*. See also LYLY, JOHN.

EU′PHYLLOP′ODA. See BRANCHIOPODA.

EUPOL′EMUS. A Jewish historical writer, the author of a work entitled *Concerning the Kings of Judæa*, of which excerpts made by Alexander Polyhistor have been preserved by Clement of Alexandria (*Strom.* i, 23, 153) and Eusebius (*Præparatio evangelica*, ix, 26, 30–34, 39). He spoke of Moses as the inventor of the alphabet, from whom it passed to the Phœnicians and the Greeks. He is generally supposed to have written c.158 B.C., but the passage in Clement (*Strom.* i, 21, 141) referring to him is of doubtful interpretation, and Willrich maintains that he flourished in the lifetime of Alexander Polyhistor (c.80–40 B.C.). The fragments were published by Kuhlmey, *Eupolemi Fragmenta* (Berlin, 1840), and Müller, *Fragmenta Historicorum Græcorum*, iii, pp. 207 ff. (Leipzig, 1849). Consult also Willrich, *Juden und Griechen* (Göttingen, 1905), and Schürer, *Geschichte des jüdischen Volkes* (4th ed., Leipzig, 1909).

EU′POLIS (Lat., from Gk. Εὔπολις) (c.446–411 B.C.). An Athenian poet of the Old Comedy, ranking with Cratinus and Aristophanes. His first play was produced in 429 B.C., when he was but 17 years old. He produced in all 14, or, according to Suidas, 17 pieces, of which seven won the first prize. In the early part of his career he was on terms of close friendship and collaborated with Aristophanes, but later the relation was changed so that each accused the other of plagiarizing from his dramas. Eupolis died apparently in 411 B.C. in a naval battle, in consequence of which misfortune it is said the Athenians thereafter exempted poets from military service. The fragments are collected in Meineke, *Fragmenta Comicorum Græcorum*, vols. i, ii (Berlin, 1839–57), and Kock, *Comicorum Atticorum Fragmenta*, vol. i (Leipzig, 1880). Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (5th ed., Munich, 1908).

EURAQUILO, ū-răk′wĭ-lō (from Gk. Εὖρος, *Euros*, east wind + Lat. *Aquilo*, northeast wind, i.e., an east-northeast wind). The popular name, given doubtless by sailors, for the wind which struck the ship on which Paul was making his voyage to Rome. The ship had left the shelter of Cape Matala, on the south coast of Crete, with the purpose of making the winter harbor of Phenix (Authorized Version, Phenice), farther westward on the same island (Acts xxvii. 13, 14). In the Authorized Version, following inferior manuscript reading, it is called Euroclydon. It came evidently in a sudden change from the mild south wind under which the ship was sailing, and consisted in a violent gale descending from the mountainous heights of the island and accompanied with typhonic manifestations.

EURA′SIANS (from *Europe* + *Asia*). A term of varied application. In India it has been used for more than half a century to denote the mixed offspring of European and Hindu parents. Following the geological designation of the seeming unity of the continents of Europe and Asia as Eurasia, the word "Eurasians" came to be used in an allied ethnographic and ethnological sense. Thus, Keane (1896) finds the cradle land of the Aryans in the Eurasian steppe, and Deniker (1900) makes a Eurasian group, to include such peoples (Ugrians, Turko-Tatars, etc.) which have representatives in both continents. Sergi, in his *Mediterranean Race* (London, 1901), applies the term "Eurasiatic" to that variety of man which "brought with it into Europe [from Asia in the later Neolithic period] flexional languages of Aryan or Indo-European type."

EURE, ĕr. A northwestern department of France (Map: France, N., F 3), formed from parts of the ancient Perche, Normandy, and the Countship of Evreux. Area, 2331 square miles. Pop., 1901, 334,781; 1911, 323,651. Its surface is level, never rising above an altitude of 700 feet, and the soil is fertile. The principal river is the Seine, which, entering the department from the southeast, flows through it in a northwesterly direction to Pont-de-l'Arche. The Eure, from which the department derives its name, and the Rille, both affluents of the Seine, are the only other important streams. The chief products are grain, hemp, flax, vegetables, and fruits, particularly apples and pears, from which large quantities of cider and perry are made; and lime, clay, stone, and marl are quarried. The breeding of cattle, sheep, and the famous Normandy horses is favored by extensive meadow and pasture lands. There are extensive iron, zinc, and copper works. Cotton goods, cloth, linen, glass, nails, musical instruments, bricks, sugar, pins, and stoneware are likewise manufactured. Capital, Evreux.

EURE. A river in the northwestern part of France, and a tributary of the Seine (Map: France, N., G 2). It rises in the Department of Orne, flows first southeast into the centre of the Department of Eure-et-Loir, then north and northwest through the departments of Eure-et-Loir and Eure, joining the Seine above Pont-de-l'Arche, after a course of about 112 miles, for 50 of which it is navigable. On its banks is the town of Chartres.

EURE, J. C., DUPONT DE L'. See DUPONT DE L'EURE.

EURE-ET-LOIR, ĕr′-ā-lwär′. A northern department of France, formed from the ancient provinces of Orléanais and Normandy (Map: France, N., G 4). Area, 2293 square miles. Pop., 1901, 275,433; 1911, 272,255. It is watered mainly by the Eure in the north and the Loir in the south, the two rivers from which it takes its name. In the east is the fertile plain of Beauce, while the west is a country of hill and valley. The department is generally level. The soil is fertile and wheat, oats, and apples are largely produced. Manufactured products include textiles, farm implements, hats, shoes, and paper. Capital, Chartres.

EURE′KA (Gk. εὕρηκα, I have found). An exclamation attributed to the philosopher Archimedes, who is said to have cried "Eureka! Eureka!" upon discovering the principle of specific gravity, whereby he was enabled to determine what proportion of silver alloy was contained in the golden crown of King Hiero of Syracuse.

EURE′KA. A city and the county seat of Humboldt Co., Cal., 224 miles (direct) northwest of San Francisco, on the Northwestern Pacific Railroad, and on Humboldt Bay, connected with Pacific coast ports by regular steamship lines (Map: California, A 2). It possesses a fine harbor which has been improved by the United States government. Sequoia Park, a tract of redwood forest of 40 acres, is still practically in its virgin state. The noteworthy features are the Carnegie library, Federal building, county jail, hospital, city hall, and courthouse. An extensive trade is carried on in redwood lumber, shingles, butter, fish, apples, and wool, the exports in 1912 amounting to $10,960,000. There are shingle mills, tobacco factories, bottling works, sash and door factories, marble and granite works, a tannery, iron foundry, woolen mill, etc. The government, under a charter of 1895, is vested in a mayor, elected biennially, and a municipal council. First settled in 1850, Eureka became the county seat and was incorporated in 1856. Pop., 1900, 7327; 1910, 11,845; 1914 (U. S. est.), 13,768; 1920, 12,923.

EUREKA. A city and the county seat of Woodford Co., Ill., 19 miles east by north of Peoria, on the Toledo, Peoria, and Western and the Atchison, Topeka, and Santa Fe railroads (Map: Illinois, F 4). Eureka College (Christian), established in 1855, is situated here. The city has a large cannery. Eureka was incorporated as a town in 1856. The water works are owned by the municipality. Pop., 1900, 1661; 1910, 1525.

EUREKA. A city and the county seat of Greenwood Co., Kans., about 90 miles (direct) south-southwest of Topeka, on Fall River, and on the Missouri Pacific and the Atchison, Topeka, and Santa Fe railroads (Map: Kansas, F 7). The Southern Kansas Academy (Congregational) is situated here, and there is a Carnegie library. Cattle raising is the chief industry. Eureka has adopted the commission form of government and owns its water works. Pop., 1900, 2091; 1910, 2333.

EUREKA. A town and the county seat of Eureka Co., Nev., about 75 miles (direct) east of Austin, on the Eureka Nevada Railroad (Map: Nevada, E 3). It was once a productive gold, silver, and lead mining camp and had smelting and refining plants. Eureka suffered severely from fires in 1878 and 1879 and from a washout in 1910. Pop., 1900, 877; 1910, 661.

EUREKA. A city in Juab Co., Utah, 90 miles south by west of Salt Lake City, on the Rio Grande Western and the San Pedro, Los Angeles, and Salt Lake railroads (Map: Utah, B 3). It is in a copper and silver mining region and has smelters and quartz mills. The city contains a Carnegie library. Pop., 1900, 3085; 1910, 3416.

EUREKA SPRINGS. A city and one of the county seats of Carroll Co., Ark., 150 miles northwest of Little Rock, on the Missouri and North Arkansas Railroad (Map: Arkansas, B 1). It is a noted health resort, popular for its picturesque and elevated situation among the Ozark Mountains, its healthful climate, and its medicinal springs, 40 in number. In the vicinity a fine grade of onyx is found. The city contains the Crescent College for Girls, a Carnegie library, and several hotels, and has fruit-growing interests and manufactories of onyx curios. The water works are owned by the city. Pop., 1900, 3572; 1910, 3228.

EURIC. A king of the Visigoths. See GOTHS; VISIGOTHS.

EURINGER, oi′rĭng-ĕr, SEBASTIAN (1865–). A German Semitic and biblical scholar, born in Augsburg. He studied at Munich, Oxford, Heidelberg, Freiburg, Strassburg, Jerusalem (Ecole Biblique Pratique), and Tübingen. He was ordained in 1887, preached for two years, and then traveled widely in Egypt and Palestine. In 1894–1900 he was pastor of a church near Augsburg and then became professor in the Dillingen Lyceum. Among his books, all the more valuable for his personal experiences, are: *Der Masorahtext des Kohelet* (1890), *Die Auffassung des Hohenliedes bei den Abessiniern* (1900); *Die Chronologie der biblischen Urgeschichte* (1909); *Die Kunstform der althebräischen Poesie* (1912); *Ein unkanonischer Text in der armenischen Bibel* (1913).

EURIPIDES, ū-rĭp′ĭ-dēz (Lat., from Gk. Εὐριπίδης) (c.480–406 B.C.). The latest of the three great Greek tragic poets. He was born, tradition said, in Salamis on the day of the great sea fight with the Persians. His parents, Mnesarchides and Clito, were of humble station; they lived at one time in banishment in Bœotia, and on their return to Athens are said to have engaged in petty retail trade. Their son, however, had a good education. He produced his first play, *The Daughters of Peleus*, at the age of 25. From that time he devoted himself to the tragic stage. His first play won but the third place, and he gained the first prize only after 14 years of disappointment. This distinction he enjoyed but five times in all (one author, however, says he won 15 times). Euripides was of a studious and speculative nature and was a friend and disciple of Anaxagoras, Prodicus, Protagoras, Socrates, and others, although he attached himself to no particular philosophic school. He possessed a gloomy temperament, was morbidly sensitive, and apparently felt himself misunderstood by his fellow Athenians. He took no part in politics, but lived in his library. The latter part of his life he spent away from Athens, first in Magnesia, then at the court of Archelaus at Pella in Macedonia. He died in the spring of 406 B.C. at Arethusa, near Amphipolis, and was buried not far from that city. At Athens a cenotaph was erected to him, the epitaph of which declared that all Greece was his monument, and that the earth of Macedon covered only his bones.

In sharp contrast to his two great predecessors, Æschylus and Sophocles, Euripides represents the new moral, social, and political movements which were transforming Athens at the end of the fifth century B.C. He is also distinguished from the earlier tragedians by the fact that his interest lay in the thought and experience of the ordinary individual far more than in the sufferings of legendary beings belonging to the heroic past, so that, while he drew characters from the old mythology, he treated them in a thoroughly realistic fashion; they were no longer ideal personages far removed from everyday life, but contemporary Athenians representing every grade of society to be found in Athens at his time. In fact, Euripides shifted the tragic situation from a conflict between man and the divine laws of the universe to man's inner soul, where the struggle is between his better impulses and the evil suggestions of his baser self. He is, furthermore, the most modern of all the Greek dramatists in his tenderness and sentimentality; in some plays he appears as the precursor of the modern romantic school. In his lost *Andromeda*, of which the theme was Perseus's affection for the princess whose life he had saved, he produced the only known example among the tragedies of antiquity of a plot based on the favorite motive of the modern novel.

Euripides shared in the current skepticism of the day as to the older religious beliefs, and many passages in his tragedies betray his doubts. His attitude not unnaturally brought down upon his head the wrath of the conservatives, of whom Aristophanes was the chief literary representative. In Euripides' language the speech of common life had a considerable part, and his style shows a remarkable smoothness and dexterity; Aristophanes actually imitated it, and Aristotle praised it, so that it was the model for the writers of the later comedy. The structure of his plays, however, is often dramatically defective, as many of them are made up of brilliant detached episodes and do not form coherent units through which the plots are gradually developed. On the other hand, in other plays, as, e.g., in the *Medea*, the plot is steadily developed from beginning to end. Euripides has been blamed for his use of the explanatory prologue, in which he makes known to the spectators the events which precede the opening of the play and oftentimes outlines coming events. But he deserves censure, not for his employment of such prologues, but for the manner in which he managed them, for many of them are mechanical and 10 are burdened with long genealogies which deserve the ridicule that Aristophanes heaped upon them. He also resorts too often to the "deus ex machina" (q.v.) to solve his tragic situations, and the choral songs have frequently nothing to do with his play. Yet with all allowances for his defects, Euripides remains a great tragic poet. His greatest strength lay, as was pointed out in antiquity, in the representation of human passion and in his recognition scenes. After the beginning of the Peloponnesian War, Euripides enjoyed great popularity, and his fame was not confined to Attica alone. In the fourth century he was read and presented almost to the exclusion of the two older poets. His writings exercised a profound influence on the Romans, especially through Ennius. The vases from southern Italy which have representations of scenes from his work attest his fame there in the fourth and third centuries B.C., and in the Roman and Byzantine periods he was highly esteemed and imitated. In modern times he has influenced English, German, and especially French dramatists.

Euripides took his plots from the same general sources as previous poets. A considerable number of plays are based on the legends of Thebes, Argos, and the stories of Heracles; the Trojan cycle had less charm for him, so that only about a fifth of his plots can be traced to that source, although 10 of the extant plays, including the *Rhesus*, which popular taste has preserved to us, belong to this cycle. The myths of his native Attica, however, had a strong attraction for him, and he took pleasure in celebrating the Athenian heroes, Ægeus, Theseus, and Erechtheus. He also sought for subjects in new fields, especially for themes which exhibited violent passion or romantic adventures. Such were the stories of Bellerophon, Cresphontes, and Phaëthon, which he handled for the first time. He also treated his mythology with great freedom, sometimes varying it in different plays, or enlarging and developing a myth until it was practically his own invention.

Tradition says that he left 92 plays in all. Of these we possess but 18, and the *Rhesus*, which is almost universally regarded as spurious. The genuine plays are: *Alcestis* (438); *Andromache; Bacchæ; Hecuba; Helena* (412); *Electra; Heracleidæ; Hercules Furens; Supplices; Hippolytus* (428); *Iphigenia Aulidensis; Iphigenia Taurica; Ion; Cyclops* (the single satyr drama extant); *Medea* (431); *Orestes* (408); *Troades* (415); and *Phœnissæ*. Only the dates given are known with certainty; but the *Bacchæ* and the *Iphigenia Aulidensis* were produced after the poet's death. Consult Grace H. Macurdy, *The Chronology of the Extant Plays of Euripides* (Lancaster, Pa., 1905). Besides the above complete plays, over 1100 fragments of the other dramas have been preserved. Of the extant plays, the *Medea, Hippolytus, Bacchæ*, and *Iphigenia Taurica* are the best.

The best critical editions are by Kirchhoff (Berlin, 1855); Nauck (Leipzig, 1871); Prinz and Wecklein (ib., 1895–1905); a complete edition with English commentary by Paley (3 vols., London, 1858–60; vols. i and ii in 2d ed., 1872–75); Murray (Oxford, 1901–13). For the fragments, consult Nauck, *Fragmenta Tragicorum Græcorum* (2d ed., Leipzig, 1889). For recently discovered fragments, consult Von Arnim, *Supplementum Euripideum* (Bonn, 1912); Hunt, *Oxyrhynchus Papyri*, vol. ix (London, 1898–1914). Commentated editions of single plays are very numerous; only a few of the best English editions can be named here: *Alcestis*, Earle (New York, 1894), Haley (Boston, 1898); *Bacchæ*, Sandys (2d ed., Cambridge, 1885), Tyrrell (London, 1892); *Helena*, Jerram (Oxford, 1881); *Heracles*, Wilamowitz-Moellendorf (Berlin, 1889; later ed. in 2 vols.); *Heracleidæ*, Beck (Cambridge, 1882); *Hippolytus*, Harry (Boston, 1899); *Ion*, Verrall (Cambridge, 1890); *Iphigenia at Aulis*, England (London, 1891); *Iphigenia among the Taurians*, England (ib., 1880); Jerram (Oxford, 1885); *Medea*, Earle (New York, 1904), Allen-Moore (Boston, 1901), Verrall (Cambridge, 1883); *Troades*, Tyrrell (London, 1897). The scholia are best edited by Schwartz (Berlin, 1887–91). There is an excellent English translation in verse by Way (London, 1894–98; rev. ed., ib., 1912); prose translation by Coleridge (ib., 1885).

Consult: Wilamowitz-Moellendorf, *Analecta Euripidea* (Berlin, 1875); Mahaffy, *Introduction to the Study of Euripides* (London, 1879); Decharme, *Euripides and the Spirit of his Dramas* (New York, 1906); Verrall, *Euripides the Rationalist* (Cambridge, 1895); Haigh, *Tragic Drama of the Greeks* (Oxford, 1896); England, *Euripides and the Attic Orators* (London, 1898); Nestle, *Euripides, der Dichter der griechischen Aufklärung* (Stuttgart, 1901); Huddilston, *Greek Tragedy in the Light of Vase Paintings* (New York, 1898); translation of various plays by Gilbert Murray (London, 1902 et seq.); Verrall, *Four Plays of Euripides* (New York, 1905); Masqueray, *Euripide et ses idées* (Paris, 1908); Murray, *Euripides and his Age* (New York, 1913); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (5th ed., Munich, 1908); Steiger, *Euripides: Seine Dichtung und seine Persönlichkeit* (Leipzig, 1912).

EURI'PUS (Lat., from Gk. Εὔριπος). The narrowest part of the channel between the island of Eubœa and the mainland of Greece. Opposite Chalcis the width of the strait is but a little over 40 yards, and it is very shallow. Here a rock in the channel facilitated the construction of a bridge as early as 410 B.C. Exceedingly swift and variable currents exist in the strait. The name is sometimes used in a wider sense to designate the southeast portion of the Eubœan Channel. See CHALCIS.

EUROC'LYDON. See EURAQUILO.

EURO'PA, or **EURO'PE** (Lat., from Gk. Εὐρώπη, *Eurōpē*). In Greek legend, a daughter of Phœnix, King of Phœnicia, or of Agenor. Her beauty attracted the attention of Zeus, who appeared in the form of a white bull and carried her to Crete, where she became the mother of Minos, Rhadamanthus, and Sarpedon. Zeus presented her with the bronze man, Talos, a dog who never lost his prey, and a spear which never missed its mark, and later gave her to King Asterius of Crete, who adopted her sons. After her death she was worshiped in Crete under the surname Hellotia, or Hellotis. Modern mythologists are inclined to see in Europa a moon goddess, or else an earth goddess of fertility, like Demeter. See also CADMUS. Consult Escher, "Europe, i," in Pauly-Wissowa, *Real-Encyclopädie der classischen Altertumswissenschaft*, vol. vi (Stuttgart, 1909).

EUROPA, THE RAPE OF. The subject of several paintings. One by Titian (1562), representing the Phœnician damsel borne through the waters on the back of Zeus, metamorphosed into a bull, and followed by three Cupids, one being seated on a dolphin's back, is now at Cobham Hall, England. The most celebrated example is by Paul Veronese in the Ducal Palace, Venice, in which Zeus in the form of a bull reclines under the trees, and Europa is assisted to his back by her attendants. Two cupids hover above with wreaths of flowers, and a third holds a cord, attached to a wreath around the bull's horns. In the background are smaller representations of the bull entering the water and of the bull swimming. Claude Lorrain's

"Rape of Europa" (Buckingham Palace) is rather a landscape than a figure painting.

EUROPE. The name is derived, according to the researches of Kiepert, Egli, and other scholars from the old Assyrian Irib or Ereb = sunset or west, which was applied to Greece to distinguish that region from Asia Minor, which was designated as Assu = sunrise or east. These names, in their later forms, were finally extended—the one from Greece over all Europe, and the other from Asia Minor over all Asia.

Europe is the smallest of the continents excepting Australia. Its area is about 3,796,000 square miles, or approximately one-fourth greater than that of the United States exclusive of Alaska. It includes, with its polar and other islands, only 7.0 per cent of the land surface of the world. It is surrounded on three sides by the sea, but its eastern frontier for about 2000 miles joins that of Asia. The political boundary in the east does not entirely conform with the natural boundary. The line is carried to the east of the central and southern Ural Mountains, the natural boundary, in order to include the rich mining districts, east of the mountains, in Russia; to the south of the Ural Mountains the Ural River is the boundary. Between the Black and Caspian seas the main ridge of the Caucasus is generally taken to be the boundary between Europe and Asia. The natural boundary in the southeast is, however, now considered by some geographers to be through the depressions of the Sea of Azov and the East and West Manitch rivers to the Caspian Sea, the entire Russian possessions south of the Manitch rivers (Ciscaucasia and Transcaucasia) being in this way included in Asia. The continent extends west and east through nearly 75° of longitude, from Cape Roca, near Lisbon, to the Tobol River. Penetrating the polar ice zone (North Cape, 71° 11′ N.), its most southerly point is Cape Tarifa, Spain, which is crossed by the thirty-sixth parallel. In proportion to area it has a much longer coast line than any other continent—over 20,000 miles, including the more important indentations, but double that length if the entire shore line is closely followed. While Europe is merely a peninsula of the great land mass of Asia, the separation of Eurasia into two continents has been so long followed—a custom which originated probably in the actual separation of the densely populated regions of both by arid and semiarid expanses—it is natural to treat it as a distinct subdivision of the earth's surface.

The situation of Europe gives it a central position in the land hemisphere. It is separated from America by the comparatively narrow Atlantic Ocean. Africa is plainly in view across the Strait of Gibraltar, 9 miles wide; Europe also closely approaches Africa at the strait between Sicily and Tunis.

Topography. Three phases of the topographic aspects of Europe are particularly noteworthy: (1) the dissected, pointed, broken character of a large part of the coast line, giving it relatively a greater coastal development than any other continent possesses; (2) the predominance of low plains and the small area of high table-lands inclosed by mountains, a characteristic feature of inner Asia; (3) the absence of deserts, Europe being the only continent without desert areas.

On the Atlantic and the Mediterranean sides are a rich island world and a number of very large peninsulas, the islands and peninsulas embracing about half as large an area as that of the continental mass. Most of the Atlantic islands rise from the continental shelf, were once a part of the continent, and are now the ruins of its former edge. The ocean far and wide around them does not exceed 700 feet in depth. These fragments, the more resistant rocks which withstood the action of waves and ice or the higher lands which were not submerged, are particularly numerous north of the fiftieth parallel. Very conspicuous islands among many hundreds are Nova Zembla, Vaigatch, and Kolguyev (on the Arctic side); Zealand and other Danish islands, Gothland, Ösel, Dagö, and Åland (in the Baltic); and most important of all, the British Isles, Shetlands, and Orkneys, composing the British group; to these may be added the distinctive polar islands, Spitzbergen, Bear Island, Jan Mayen, and Franz-Josef Land. The islands in the ocean, including the Baltic, have an area about six times as large as those of the Mediterranean, which include the Balearic group, Sardinia, Corsica, Sicily, Crete, Cyprus, and the numerous islands of the Grecian Archipelago in the Ægean Sea. Between the Scandinavian peninsula, the largest in Europe, and the Jutland peninsula the deep sea is admitted into the continental mass. Here is the Mediterranean of the north, the Baltic Sea with its three extensions, the gulfs of Bothnia, Finland, and Riga. Only one-fourth as salt as the ocean, and therefore freezing more easily, most of this inland sea is unavailable for navigation during the ice months. The many large rivers emptying into the Baltic and its narrow connection with the ocean account for its small salinity. On the other hand, the North Sea, between Great Britain and the continent, is, in fact, a part of the Atlantic and has the full effect of its tides. Brittany is a peninsular projection, which bounds the deep recess of the Bay of Biscay on the north.

In the extreme south the continent possesses three great peninsulas—the Iberian, the Italian, and the Balkan. The northern part of the Mediterranean is divided by these peninsulas into several sections: the Ægean Sea, between the Balkan Peninsula and Asia Minor, connected with the inclosed basins of the Sea of Marmora and the Black Sea by the narrow strait of the Dardanelles and the Bosporus; the Ionian and the Adriatic seas between the Balkan Peninsula and Italy; and the Tyrrhenian Sea, in the triangular space between Italy and the three large islands of Sicily, Sardinia, and Corsica; the great bight north of Corsica is the Gulf of Genoa.

All the prominent forms of flat and steep coasts are represented on the shores of Europe. The fiord coasts of Norway and western Scotland, the deep and comparatively wide indentations of the west coasts of England and Ireland, Brittany, and northwest Spain provide a great number of excellent natural harbors, which promoted the sea trade of the Middle Ages, and have stimulated the immense development of ocean commerce in modern times. The most unfavorable harbor conditions are found along the flat, sandy coasts of the lowlands of the Netherlands and Belgium, northwest Germany, the west side of Jutland, and the French coast on the Bay of Biscay. Here, as also for the most part on the east side of Great Britain, only river mouths offer good harbors. The importance of the sea trade here depends upon flood tides and favorable conditions at the river mouths, the largest vessels being able to navigate the rivers only at high tide. A large number of the Atlantic cities are river ports, Hull and London, Antwerp, Rotterdam, and Amsterdam, Hamburg and Bremen, Havre and Bordeaux, Oporto and Lisbon. River ports are also most numerous on the Baltic, though shipping there does not have tidal advantages. A peculiarity of the German Baltic coast is the sand dunes parallel with the shore which separate the coastal plain from the tide-washed beach.

The conditions are very different on the Mediterranean shores, where high, steep coasts are the prevalent feature, flat coasts and delta formations being exceptional. The flow and ebb of the tide are insignificant, the little rivers are unimportant for commerce, and there are no noteworthy river ports, which reappear only on the shores of the Black Sea and the Sea of Azov. Many important ports on the Mediterranean have developed without the advantages afforded by navigable rivers.

Europe owes a large part of its commercial supremacy to the remarkable development of its coast line, lengthened as it is by many islands, channels, and the deep penetration of the sea into the land.

The three most conspicuous topographic forms of the continental mass are the highland belt in the south, the secondary mountains north of it, and the lowlands. The highland belt is the western member of the great mountain zone that extends through the Old World from the upper courses of the Yang-tse and Hoang rivers to the Atlantic. This high zone is extended into Europe by the Caucasus Mountains (Elbruz, about 18,500 feet) and the mountains of the Crimea. It is then interrupted by the depressions of the Black and Ægean seas, beyond which lies the Alpine system. The Alpine system consists of a series of long and connected mountain chains of which the Alps are the heart, the highest and most prominent features. The Apennines, the Balkan Mountains, and the Carpathians, sweeping around the basin of the Danube to the Balkans, are directly connected with the Alps. The high mountains of the Pyrenees have no superficial connection with the Alps; neither (except as the return chain of the Apennine system) has the Sierra Nevada of southern Spain, which is regarded as the frontal range of the Atlas Mountains of Africa. The highland belt west of the Black Sea reaches its culmination in the Alps (Mont Blanc, 15,782 feet), which are at once the highest and most passable of all these mountains. No other high mountains of equal extent, except the Rocky Mountains in the United States, have so many passes that are easy to cross; the Alps, therefore, despite their vast snow fields and numerous glaciers, offer little or no impediment to commerce, while the Pyrenees are practically impassable except around their extreme ends.

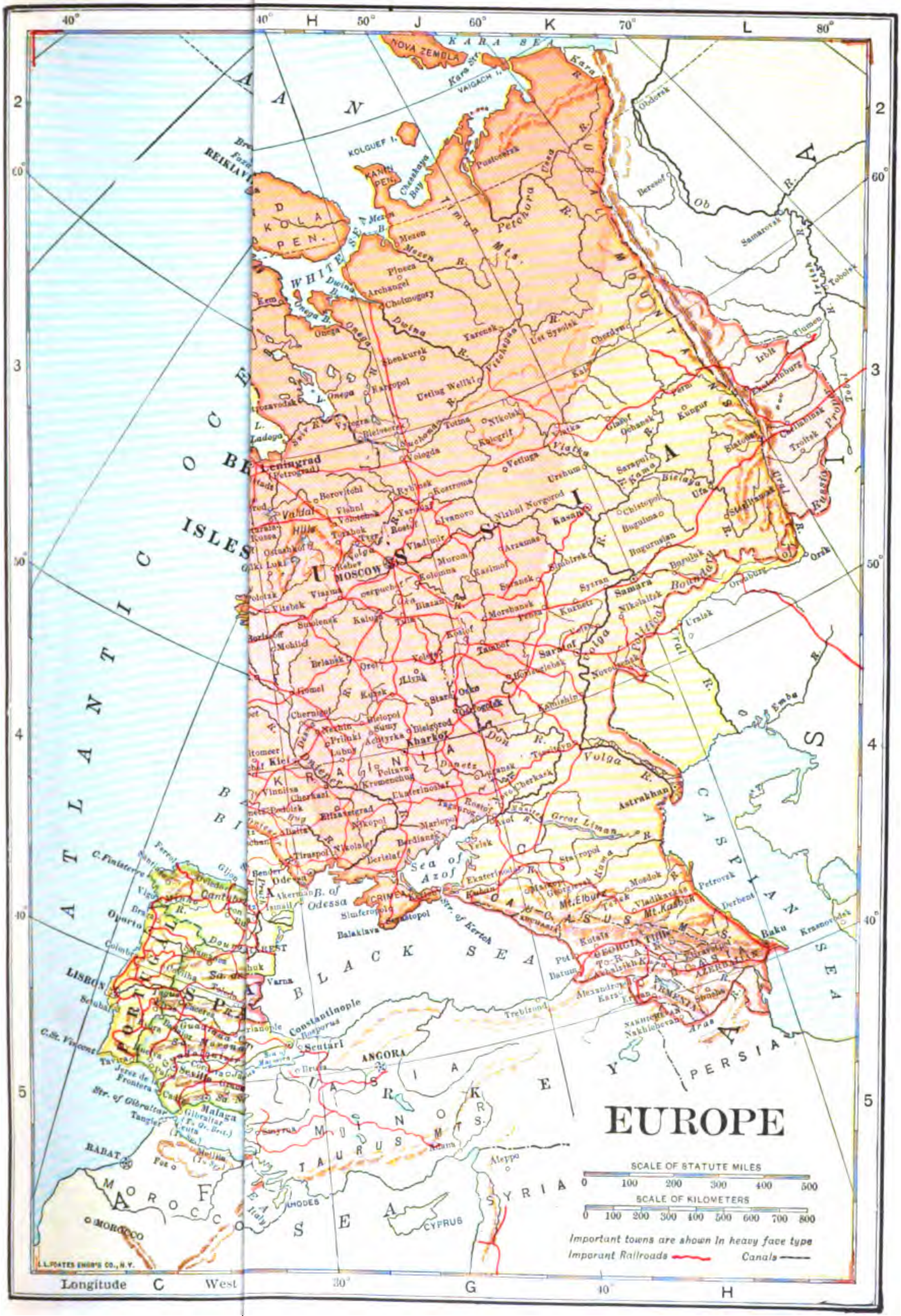
The mountains to the north of the highland belt are of a very different character. While they include mountain ranges, they are much shorter than in the highland belt. Mountain chains, groups of mountains, isolated mountains, and plateaus are intermingled in great variety. With the exception of the Scandinavian Mountains, they are all comparatively low, and the Germans have therefore designated them as the Mittelgebirge, intermediate or secondary mountains. The groups of the northern mountains are the mountains of southern Poland, the mountains of south and central Germany and France (Jura, Vosges, Bohemian Forest, Erzgebirge, Riesengebirge, Thuringian Forest, Harz, Black Forest, etc.), the British mountains, and the Scandinavian-Finnish mountains. The highest are the mountains of Scandinavia, which cover most of Norway and slope steeply to the sea, but gradually into Sweden. Far to the east and isolated from all other mountains of Europe are the Urals, the longest mountain chain of the continent, rising steeply from Asia, but sloping very gradually to the plain on the European side.

The continent of Europe has but a single active volcano within its borders—Vesuvius. Etna is on the island of Sicily. Other insular volcanoes are Stromboli, the active parts of Santorin, and Skaptar-Jökull in Iceland. Among the ancient volcanic regions may be mentioned the Alban Mountains of Italy, the Tokay District of northern Hungary, Auvergne in France, the Eifel region of Germany, and the northwest of the British Isles (with the Giant's Causeway, Fingal's Cave, etc.).

Two-thirds of the continental mass is lowland. The vast low plain of north Asia, the tundra, interrupted only by the Urals, is continued through Russia, the northern half of Germany, and through France to the Pyrenees. Smaller plains, both high and low, are also found within the mountain lands. The most important of these high plains are those of Switzerland (between the Jura and the Alps), where most of the people live, the plain being as densely populated as Germany or France; the plains of south Germany along the northern edge of the Alps; and the two high plains of Castile in Spain. The most important of the mountain-inclosed lowlands are those of the Alpine streams; the great, rich plain of the Po basin; the plains of the upper Rhine; and the four great lowlands of the Danube basin, including a large region around Vienna, the upper and lower plains of Hungary, a region of wheat and grazing, and the Wallachian plain, one of the granaries of Europe.

Generalizing these facts as to the topographic forms of the continent, it may be said that Europe is divided into two parts—the eastern part Russia, and the western part the remainder of the continent. The eastern part is an unbroken lowland, mountains rising only on its eastern and southern edges. The western part has with its plains also the two forms of mountain lands above mentioned. The eastern part is broad, massive, little articulated; or, in other words, it is not made up of connected segments. It suggests north Asia, from which it is projected. The western part is narrow, richly articulated, open everywhere to the influences of the sea. The character of the eastern part is uniformity; that of the western part, diversity.

Hydrography. The chief water parting of the continent may be shown by a line drawn from the central Urals, southwest across the Carpathians, through the secondary mountains of Germany and France to the Iberian Peninsula. All the rivers northwest of this line flow to the Arctic Ocean, the Baltic and North seas, the English Channel, or the Atlantic; all rivers southeast of the line flow to the Mediterranean, the Black, and the Caspian seas. The largest rivers are on this southeastern slope. The arrangement of the rivers of the eastern part of Europe (Russia) is simple. The Petchora, Dvina, Düna,


EUROPE
SCALE OF STATUTE MILES
0 100 200 300 400 500
SCALE OF KILOMETERS
0 100 200 300 400 500 600 700 800
Important towns are shown in heavy face type
Imporant Railroads
Canals
ATLANTIC OCEAN
BRITISH ISLES
RUSSIA
UKRAINE
ASIA
ASIA MINOR
BLACK SEA
CASPIAN SEA
SEA of AZOF
KARA SEA
NOVA ZEMBLA
KOLGUEF I.
WHITE SEA
KOLA PEN.
URAL MOUNTAINS
CAUCASUS MTS.
TAURUS MTS.
CRIMEA
PERSIA
SYRIA
CYPRUS
RHODES
MOROCCO
SPAIN
PORTUGAL
Leningrad
MOSCOW
Kiev
Kharkov
Odessa
Constantinople
ANGORA
Astrakhan
Baku
Tiflis
Samara
Kasan
Nizhni Novgorod
Archangel
LISBON
RABAT
Str. of Gibraltar
Longitude
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and Niemen flow to the northwest, and the Ural, Volga, Don, Dnieper, and Dniester to the south. The distribution of rivers in the western part is more complicated. Each of the five chief outlying members of the continent (the three southern peninsulas, Scandinavia, and the British Isles) has its own river system. In the continental mass the slopes from the mountains to the low plains north and south of them give direction to the river courses. The Vistula, the Oder, the Elbe, the Weser, the Rhine, the Seine, the Loire, and the Gironde follow the slope to the north and west; only the Rhine, of all these rivers, comes out of the Alps. Three rivers are exceptions to this rule; for the Danube, rising in the German Mittelgebirge, the Po, and the Rhône, rising in the Alps, do not flow directly away from the mountains, like the northern river, but along their edges or near them—the Danube and Po to the east and the Rhône to the west and south.

The rivers of Europe offer extraordinary advantages for commerce, although the two largest of them, the Volga and the Danube, empty into inland seas—the Volga into the Caspian, which has no outlet, and the Danube into the Black Sea; none of the great rivers is impeded by cataracts as in Africa, and their upper courses are not situated on table-lands of enormous height, unfavorable for development, as in Asia. But the rivers are so grouped that it has been possible, with the aid of comparatively short and easily dug canals connecting them, to make continuous waterways in various directions across the continental mass. Thus, freight boats ply through the land from Bordeaux to Cette, from Havre and Rotterdam to the mouth of the Rhône, from Amsterdam to the mouth of the Danube, from Danzig and Riga to Kherson on the Dnieper and thence to the Black Sea, from St. Petersburg and Archangel to Astrakhan on the Caspian. The longest river and canal routes of Russia are those connecting the Caspian Sea and the Arctic Ocean, the Caspian and the Baltic, and the Black Sea and the Baltic. Boats loaded on the Vistula in Russia may be sent direct, by inland routes, to all the ports of north Germany, and the Netherlands, Antwerp, and Havre. The importance of the Volga and the Danube, while very great locally, is diminished by the fact that they flow towards Asia and away from the great centres of commerce. Most of the Mediterranean rivers are small and of little commercial importance; even the large Rhône is too shallow for the highest usefulness. The rivers of the Atlantic watershed, including its tributary northern seas, are those that have had a profound and far-reaching influence upon the development of the world's ocean trade.

Fresh-water lakes are particularly numerous in three regions—on the Swiss plain between the Alps and the Jura, in the British Isles, and in a wide territory bordering on the Baltic in Scandinavia and northwestern Russia. The largest are on the east and south of the Scandinavian mountains, the Ladoga and Onega of Russia being the greatest of Europe's sweet-water lakes. The largest number are in Finland. These northern lakes were formed by the ancient glaciers, which left the marks of their passage deeply graven in the surface of the land, forming many lake basins. As the Swiss region has also been extensively glaciated, the high valleys still retaining the ice streams, it is one of the important lake regions. Nearly all the larger lakes are important in the inland systems of transportation. There are salt lakes in that part of Europe farthest from the sea, where the evaporation is greater than the precipitation or the river basins have no outlet to the sea. On the borders of European Russia and Asia is the Caspian Sea, the largest salt-water lake in the world.

Geology. Broadly speaking, Europe may be divided into three principal regions: 1. To the northeast of the Carpathians, the chief characteristic of the geological structure of Russia is the almost horizontal position of the sedimentary beds. In other words, the plications and dislocations of the rocks that mark the geology of the south and west are for the most part lacking in eastern Europe. 2. The south of Europe, including the Alpine system, is a region of great plications, relatively recent (the tertiary period), with elevated mountains. 3. The rest of Europe, from Bohemia to Spain and Scandinavia, shows ancient massifs plicated in the Archæan epoch, whose inequalities of relief have been largely modified by erosion. These primary massifs are separated by large areas of mesozoic and tertiary beds (the low plains), that in general are not plicated.

The geological structure of the mountain systems is varied and complicated. The Alps are composed of a granite nucleus with stratified beds, greatly faulted and folded, upon their flanks. The Jura is composed mainly of limestones, simply folded, with subsequent erosion. The Pyrenees, on the north boundary of Spain, are also of folded stratified rocks, as are many of the ranges traversing the plateau of the Iberian peninsula. The Apennines, one of the most recently formed ranges of Europe, is composed largely of Tertiary beds, much folded, the folds being arranged *en échelon*. In the south the Carpathians and Balkans are composed of a central nucleus of metamorphic schists, with stratified limestones upon their flanks. The Ural Mountains are of crystalline rocks. The mountains of the Scandinavian peninsula are of great age, being in large part Archæan with granites and schists, while down the slope towards the Baltic more recent formations successively appear, and in the southeast Triassic, Jurassic, and Cretaceous rocks are found. The great plain of Europe is floored by Cretaceous and Tertiary beds, except in Finland, where Archæan rocks, stretching across from the Scandinavian peninsula, cover the land. The mountainous portions of the British Isles are chiefly composed of granites and schists, while the lowlands are floored in great part with Jurassic beds. The northern half of Europe was in recent geologic time covered by a great ice sheet, which in its retreat has covered the land with glacial deposits, besides having by its erosion greatly modified the surface, changing the courses of the streams and scouring out lake basins. The soils of this portion of Europe are in great part composed of glacial silt and detritus, transported by this great sheet of ice.

Carboniferous coal deposits have been found in many parts of Europe between the parallels 40° and 60° N.; in eastern, southern, and west central Russia, Austria-Hungary, Germany, Belgium, France, Spain, Scotland, England, and Wales. Those of England and Wales are of special value and importance; the proximity of the English coal mines to the sea and the leading coal-buying countries make England the greatest coal exporter. The rich distribution of iron ores, together with the abundant occurrence of coal, gave Europe its manufacturing supremacy. Great Britain, mining coal and iron in the same or adjoining fields, produces about one-half of all the pig iron of Europe, drawing also, like Germany, upon the superior steelmaking ores of Spain and Sweden. Nearly two-thirds of the iron of Germany comes from the mines of Alsace-Lorraine and Luxemburg, where iron is closely associated with the coal fields of the Saar. Belgium, mining iron on the coal fields around Namur and Liége, has been called Little England, because coal and iron occur together. The best iron ores of Austria are not found near her coal, and this is true also in France except around Le Creusot and Saint-Etienne. Nine-tenths of the iron mined in France comes from the great field around Chavigny and Nancy. Iron is widely distributed in Russia, but many of the mines are not yet connected by rail with the main sources of coal. Germany is the world's largest source of zinc, and the Belgian mines are among the richest in Europe. The tin mines of England are the largest European sources of this metal. Russia supplies about 95 per cent of the platinum of the world. Most of the sulphur used in the industries comes from Sicily and south Italy. Russia is the fourth largest producer of gold in the world, Germany the fourth and Spain the sixth largest producer of silver; Spain and Portugal are, next to the United States, the largest producers of copper, and Spain provides the largest supply of quicksilver and is surpassed only by the United States in lead. Nearly every country produces its own salt, either from rock beds or by evaporating sea water in saline marshes. The Netherlands and Switzerland are lacking in useful minerals, and Italy has no coal to smelt her iron ores.

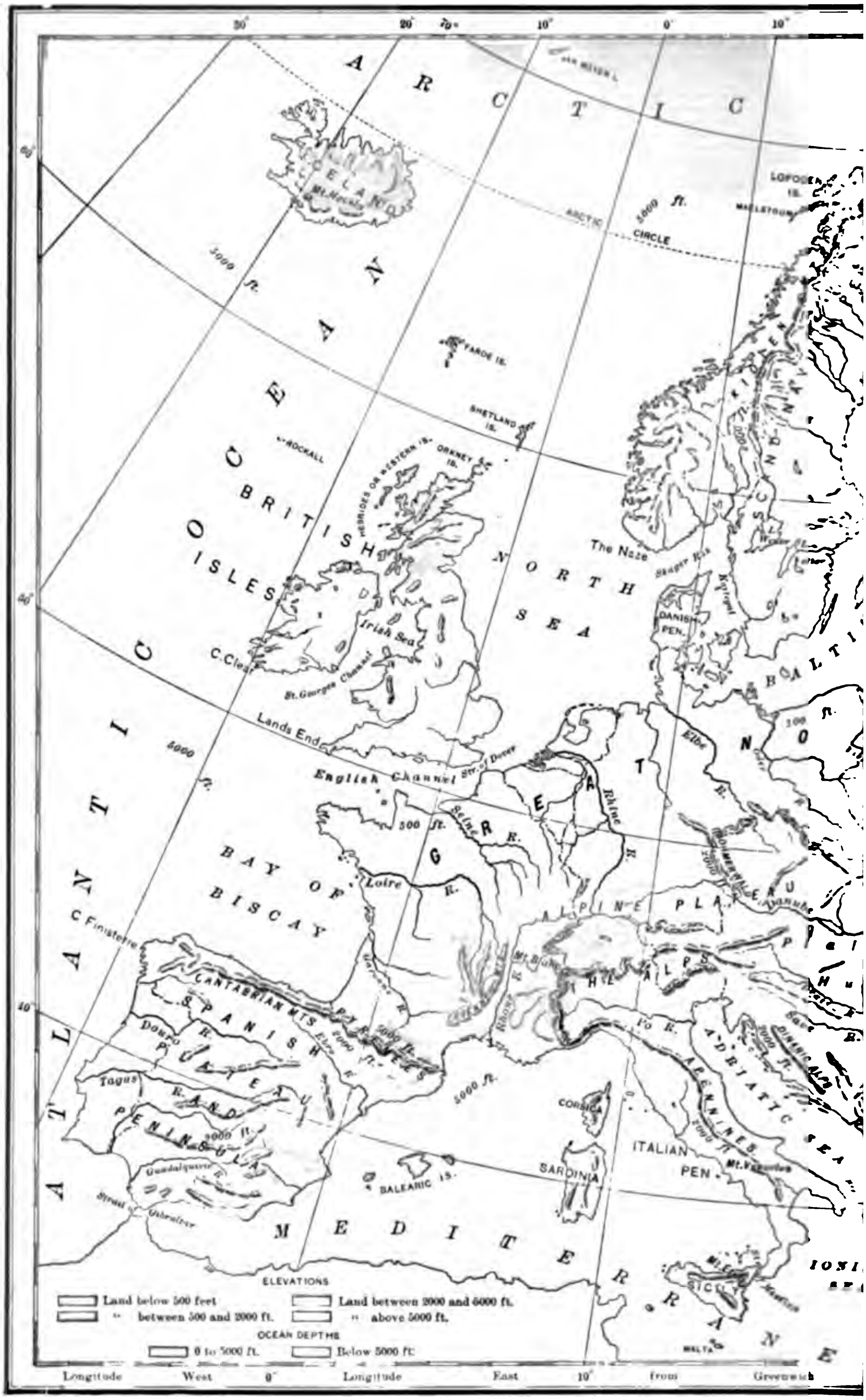
Climate. Europe is the only continent that lies entirely outside of the tropical zone, and only a small part of it is included in the frigid zone. The ameliorating influences of the north Atlantic and the westerly winds that blow over it are felt far east along the shores of the Arctic Ocean, so that at Katharine Haven, on the Murman coast, the harbor is practically ice-free the year around. Thus, though the continent extends several degrees of latitude north of the Arctic Circle, very little of it is under polar influences. The continent lies in the temperate zone; and of all the land masses in the same latitude it has the mildest and most genial climate. The warm winds from the Atlantic, the prevailing winds, have almost everywhere free access into the interior, sweeping up the arms of the sea and across the low coasts and plains, not only mitigating high and low temperatures, but also giving wide distribution to the rainfall. The fact, also, that the mean elevation of the continent above the sea is very much lower than that of any other continent excepting Australia (only about 950 feet, according to the results obtained by Supan and De Lapparent), emphasizes the prevailing temperate influences. In all parts of the continent there are sufficient warmth and rainfall for agriculture except where farm operations are prevented by cold in the extreme north and in the highest mountain regions, and by dryness on the salt steppes of the Caspian Sea.

The eastern part of Europe, however, is remote from the influence of the sea and has the continental rather than the sea climate. The mean annual temperature, therefore, declines not only from south to north, but also, except along the Mediterranean, from west to east, e.g., Greenwich, 49.7° F.; Berlin, 48.4° F., Warsaw, 44.9° F.; Saratov (East Russia), 41.7° F.—these four places being in nearly the same latitude. But while the yearly mean of temperature is lower in the east than in the west of Europe, the summer temperature is higher in the east than in the west, because the interior land mass becomes more heated than the regions bordering the sea with their more equable climate. In the south the influence of the Mediterranean is to impart to the countries along its shores a very uniform climate, the Alpine system also contributing to this advantage by warding off the cold northeast winds.

The precipitation decreases with distance from the Atlantic, the eastern part of the continent being much drier than the western, and driest along the north coasts of the Black and Caspian seas, where forest gives place to steppe. In no region, however, is the country so dry as to become a desert. In the northern half of Europe the precipitation is quite well distributed throughout the year, while winter rains predominate in all the Mediterranean countries. In a large part of Spain, e.g., irrigation is the basis of agriculture because most of the rain falls after the growing season. Many local conditions modify both temperature and quantity of precipitation. The Scandinavian mountains, e.g., are the cause of the larger precipitation on the west than on the east side of the peninsula; they also exclude the icy northeast winds of winter from the west harbors of Norway, which are ice-free.

Flora. If temperature be taken as the determinant—perhaps the simplest method in classifying the flora of Europe—three general regions are observed which more or less overlap one another. In general, the limits of these regions vary with the isotherms and with the coast lines, but are modified by mountain ranges and rivers; the summits of the former affording homes to boreal species, the valleys of the latter allowing less hardy plants to extend inland into colder localities than they could otherwise reach.

The Arctic region, mainly tundra, which in northwestern Europe finds its southern boundary on the poleward side of the Arctic Circle, and in the northeastern part of the continent extends considerably to the south of this line, is characterized on its extreme northern border by lichens and mosses, which gradually give place southward to perennials of wonderful hardiness and longevity, but of small stature, slow growth, and inferior powers of reproduction by seed. The mountains throughout the continent present similar gradations, the vegetation at the highest altitude corresponding more or less closely to that in the highest latitudes and disappearing at lower elevations among species of more temperate regions, which gradually supplant it as the altitude is reduced and the temperature consequently increased. By far the most common species of this Arctic flora are the saxifrage, potentilla, poppy, scurvy grass, crowfoot, all of which bear showy flowers; and stunted, trailing junipers, willows, and birches, which are buried under the snow during the long winters. The species of this region, about 1700, are of insignificant economic importance when compared with those of the other two


30°
20°
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A R C T I C
Jan Mayen I.
ICELAND
Mt. Hecla
Arctic Circle
5000 ft.
LOFODEN IS.
MAELSTROM
FAROE IS.
SHETLAND IS.
ORKNEY IS.
HEBRIDES OR WESTERN IS.
ROCKALL
A T L A N T I C O C E A N
BRITISH ISLES
Irish Sea
St. Georges Channel
C. Clear
Lands End
English Channel
Str. of Dover
N O R T H S E A
The Naze
Skager Rak
Kattegat
DANISH PEN.
B A L T I C
SCANDINAVIA
Elbe R.
Oder R.
Rhine R.
Seine R.
Loire R.
Garonne R.
Rhone R.
Po R.
Danube
Save R.
G R E A T N O R T H E R N
500 ft.
2000 ft.
BAY OF BISCAY
C. Finisterre
CANTABRIAN MTS
PYRENEES
5000 ft.
SPANISH PLATEAU
Douro R.
Tagus R.
Ebro R.
Guadalquivir R.
SPANISH PENINSULA
Strait of Gibraltar
ALPINE PLATEAU
Mt. Blanc
ALPS
APENNINES
ADRIATIC SEA
Dinaric Alps
ITALIAN PEN.
Mt. Vesuvius
CORSICA
SARDINIA
BALEARIC IS.
SICILY
Mt. Etna
MALTA
IONIAN SEA
M E D I T E R R A N E
ELEVATIONS
Land below 500 feet
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Land between 2000 and 5000 ft.
" above 5000 ft.
OCEAN DEPTHS
0 to 5000 ft.
Below 5000 ft.
Longitude
West
0°
Longitude
East
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from
Greenwich
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50°
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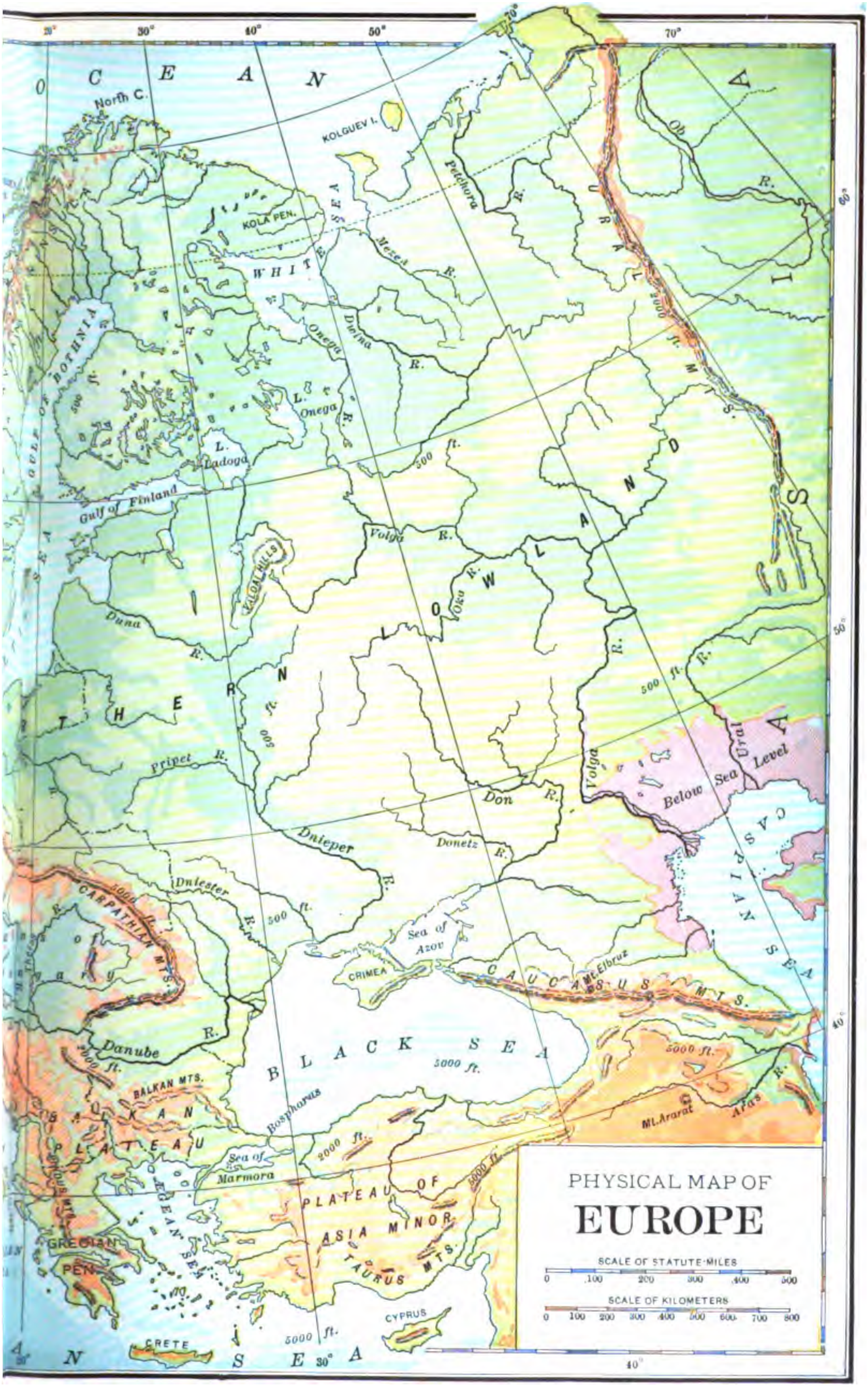


PHYSICAL MAP OF

EUROPE

regions. See ARCTIC REGION, section *Arctic Plants*.

The intermediate temperate region, which extends from the southern fringe of the Arctic region to the northern limit of the Mediterranean-Caucasian, is characterized first by more varied and numerous perennials which, as the northern limit recedes, become taller, and among which are both shrubs and trees also increasing in size and height; and second, by annual species which also increase in number and variety southward. These species, of which many appear to have migrated westward from Asia, and which are very prolific of seed, quickly take possession of abandoned land, and, being of fairly rapid growth, readily adapt themselves to wide differences of climate, withstanding on the one side the rigors of high latitudes and elevations and on the other the droughts of arid sections. In the western part forests are the dominant feature; in the eastern, steppes. Throughout the whole forest sections of this region cone-bearing trees predominate. In the far north they exclude all other species of trees, but as the latitude of central Norway is approached, ash, birch, and alder appear. The forest of southern Norway, the Baltic provinces of Russia, and especially of Denmark, though still largely coniferous, are liberally sprinkled with oak and beech and the three deciduous species mentioned. Throughout Germany and adjoining Russia, France, and Austria, the leading trees are still the conifers (pine, larch, fir), among which the others mentioned are found, mingled with which are elm, maple, acacia, and poplar.

The steppes, not unlike the great plains of North America, are treeless plains that extend across Russia. These steppes blend with the tundras of the Arctic region, and on the south with the more northerly forests of the Black and the Caspian Sea districts. Since their climate—long severe winter, short vernal season, and protracted parching summer—largely precludes the growth of perennials except along the river basins, which are often wooded, their flora consists of annuals—grasses on the arable soils, especially north of the Black Sea forests, salt-loving plants in the saline sections north of the Caspian Sea. In the northern part of both forest and steppe districts Arctic species mingle with the hardier temperate plants, in addition to which mustards, parsleys, buttercups, thistles, legumes, crowberries, brambles, bilberries, and their allies are met with in increasing frequency southward. In the southern part these last-mentioned blend with gorse, shrubby legumes, heaths, lobelias, dianthus, etc., which are most numerous towards the west, while mints, angelica, currants, rhubarb, and their congeners are more abundant towards the east. In addition this region embraces the great agricultural sections of Europe—the vast grain, flax, and grazing areas of Russia; the cereal, root, and hay fields of Germany, Norway, and Sweden; and the general farming sections of Germany, Denmark, Holland, Belgium, the British Isles, and northern France. Except on the remote north border, grasses and legumes, the bases of successful husbandry, thrive remarkably and materially influence the prosperity of the residents.

The Mediterranean-Caucasian—the fruit, flower, and vegetable—region, which extends from the Atlantic Ocean to the Caspian Sea, thus including all countries on the warm southern border of the continent, is noted for the great diversity and wide economic importance of its flora, which, it is estimated, comprises 85 per cent of all European species. Annuals and biennials appear in large numbers, the long season of growth favoring their perfect development. The forests are far more mixed than in the other two regions, and contain in addition to the abovementioned species, which appear at greater or less altitudes, evergreen and cork oak, chestnut, sycamore, mountain ash, plane, and cypress. The tendency in this region is for forests to give place to clumps of trees, and these, in turn, to scantier vegetation. Of the plants valued for their flowers may be found numerous relatives of the rose, carnation, hibiscus, lilac, tuberose, crocus, lily, colchicum, iris, and many others. In this region more than in either of the others the flora is augmented by exotic species, especially such as have been introduced by man. With the migration of the human race and the extension of commerce westward, useful plants have been purposely carried, and useless ones undesignedly transported, to regions far distant from their homes. Of such antiquity are many of the Asiatic and African contributions to this flora that many species have become so settled in their new residences as to be considered indigenous. Of these, perhaps the best known are the fig, peach, apricot, walnut, orange, olive, pomegranate, grape, quince, cherry, mulberry, pistachio, melon, leek, onion, sugar cane, cumin, and cotton. But south Europe has been not merely a greedy absorber of introduced species; it is a lavish distributer as well. Its trees, fruits, vegetables, and flowers have been carried to every quarter of the globe that European commerce has reached. Save only the plants of Norway's west coast, few in number, but of great adaptability to foreign climates, the species of no other region compare with those of south Europe as wanderers. So general has been their distribution that no traveler in any country visited by civilized man can go far without meeting plant acquaintances; if not among the useful species, then among the weeds of this Mediterranean-Caucasian region. See paragraphs on flora of the various countries; also DISTRIBUTION OF PLANTS.

Fauna. The whole of Europe belongs to the Palearctic region of Wallace, but is divided into two subregions—that of north Europe north of the Pyrenees, Alps, and Balkans, and that of the Mediterranean south of these mountains. The richness of the fauna of central and north Europe is due to the favorable climatic influences in the west and centre, the topographic variation, and the rich vegetation, especially that of the forests. On the other hand, the great density of population has much reduced the numbers of the larger animals and has even rendered some species extinct. The characteristic mammals are the bear, lynx, badger, wolf, fox, otter, marten, ermine, polecat, squirrel, marmot, mole, hedgehog, vole, shrew, dormouse, hare, and rabbit; the wild cattle have been almost wholly exterminated by man. (See CATTLE.) Among the species peculiar to this region are the desman and the chamois. The Mediterranean subregion possesses the richest fauna of the European Palearctic region, among the distinctive mammals being the fallow deer, ibex, Alpine marmot, and civet. This fauna extends also along the south shore of the Mediterranean as far as the Atlas Mountains; and this northwest corner of Africa and the Ægean Islands contain a few species, like the wild sheep, not now known in Europe, but properly a part of its fauna.

The apes are not found in Europe save for a species of macaque in the neighborhood of Gibraltar, which is more nearly allied to the Asiatic simians than to the African. Bats, cats, dogs, martens, deer, hares, and mice are found throughout Europe. Hedgehogs are not found north of lat. 60° except in Scandinavia, where they range a few degrees farther north. Moles are found between lat. 44° and 60° N., and also range a little farther north in Scandinavia. Otters and badger-like animals are found little above the Arctic Circle. Bears are not found in the extreme west, though formerly inhabiting nearly the whole of France and the British Isles. Dormice are found in western Europe as far north as the 60th parallel, but in eastern Europe not above lat. 50°. Squirrels are found throughout Europe except at the extreme north, and beavers south of lat. 65°, but not in the extreme west and not below south of the Alpine region. Swine are found south of 60°.

Of the birds, the most characteristic are the thrushes, sylviine warblers, tits, pipits, wagtails, finches, snow buntings, house sparrows, crossbills, linnets, magpies, choughs, kingfishers, goatsuckers, wood pigeons, grouse, and ptarmigans. Of the larger birds may be mentioned the eagles, falcons, owls, and ravens. Many of the numerous birds found in this region are annual migrants from the south.

Reptiles are comparatively scarce, there being found but 14 species of snakes and 12 of lizards. Only one north European serpent is venomous. Of the amphibians, several forms are peculiar to this region, among which are the eel-like proteus, the curious toad (*Alytes*), the male of which carries the eggs until they are hatched, and the *Pelodytes*, a frog peculiar to France. Frogs, toads, tree toads, and newts are common.

The characteristic fresh-water fish are the sticklebacks, perch, sheatfish, pike, carp, gudgeon, roach, chub, dace, tench, bream, bleak, loach; and among sea fish several species not known on the American shores of the Atlantic, of which the tunny and sole are most conspicuous.

Insects are numerous, butterflies especially being very abundant, and the species widely spread, but no genera are peculiar to the region. This region is also rich in beetles and other insect forms.

HISTORY

Earliest Population. Of the peoples that have inhabited Europe since the dawn of history, some—and these the most important, Greeks, Italians, Celts, Germans, and Slavs—exhibit striking resemblances in language and in their early religion and customs. Other peoples, like the Iberians, who inhabited what is now Spain, the Etruscans, who inhabited north Italy, and the Lapps and Finns, who still occupy the extreme north of the continent, apparently had from the outset dissimilar speech and customs. The resemblances noted between the peoples of the first group exist also between them and the Indo-Iranian peoples of Asia. From these data philologists have inferred that all these peoples are members of a single race, which they term the Aryan race; and since, in historical times, the Celts, Germans, and Slavs have been pressing westward, it is assumed that the original home of the Aryan race was in Asia. Modern ethnological researches, however, are tending to modify the Aryan hypothesis. On the basis of a comparison of physical characteristics, especially of skull forms, it is asserted that the original population of Europe consisted of two races, which are termed Eurafrican and Eurasian, and that the former race was originally located in the basin of the Mediterranean, the latter in the valley of the Danube or even farther east. Of the Eurafrican race two branches are found, one of which continued to live on the Mediterranean, while the other went or was driven into north Europe (the so-called Baltic branch). It is further asserted that the so-called Aryan peoples of Europe exhibit, for the most part, such a mixture of these two racial types that the resemblances which have heretofore been taken as proofs of common origin seem rather ascribable to the diffusion of the speech, religion, and customs of some superior people, partly by expansion and conquest, partly by imitation. See ARYAN; INDO-EUROPEANS; EUROPE, PEOPLES OF; MAN, ANCIENT TYPES.

Earliest Civilization. In the earliest times of which we have historic knowledge, only those parts of Europe which border upon the Mediterranean were in any sense civilized, and the points at which a Mediterranean civilization first appeared were Egypt and Phœnicia. There is increasing evidence that the civilization of these countries was of Asiatic origin. It probably came along the routes of trade from Assyria (perhaps ultimately from China), and its diffusion through the Mediterranean basin was accomplished chiefly by the earliest traders in that sea, the Phœnicians. It was in Crete, where the Phœnicians had some of their earliest trading posts, that a Greek civilization seems first to have developed. See ASSYRIA; EGYPT; PHŒNICIA.

Greek Civilization. Before the conquest of Greece by the Romans (146 B.C.), the Greeks had developed every form of government which Europe has since known. Their little city states passed from patriarchal kingship to aristocracy and from aristocracy through tyranny to democracy. In the struggle of their leading states for predominance, as on the larger theatre of Europe 2000 years later, a refined diplomacy, solicitous to maintain the balance of power, knit and dissolved alliances; and when, weakened by these internal conflicts, Greece was subjected to the military monarchy of Macedon, an era of imperialistic expansion began. In art and in letters this precocious people similarly anticipated every form of expression which European civilization has since employed; and Greek builders, sculptors, poets, and orators produced masterpieces that have not been surpassed. In philosophy also the Greeks have foreshadowed, if they did not anticipate, all the chief tendencies of modern thought. By colonization the Greek civilization was extended to Asia Minor, Sicily, south Italy (*Magna Græcia*), and many other points in the Mediterranean. By the conquests of Alexander the Great (q.v.) it became dominant in Egypt and southwest Asia. As far as Europe was concerned, the only lands which the Greeks brought into closer touch with Mediterranean civilization were those bordering on the Black Sea. In that sea the Phœnicians had had trading posts, but the Greeks founded colonies and built cities. A trade route was gradually established between the Black Sea and the Baltic, and the direct influence of the Greek civilization upon eastern Europe did not cease until Constantinople was captured by the Turks (1453 A.D.). See ARCHÆOLOGY, subdivisions I–V; GREECE; GREEK ART; GREEK LANGUAGE; GREEK LITERATURE; GREEK PHILOSOPHY.

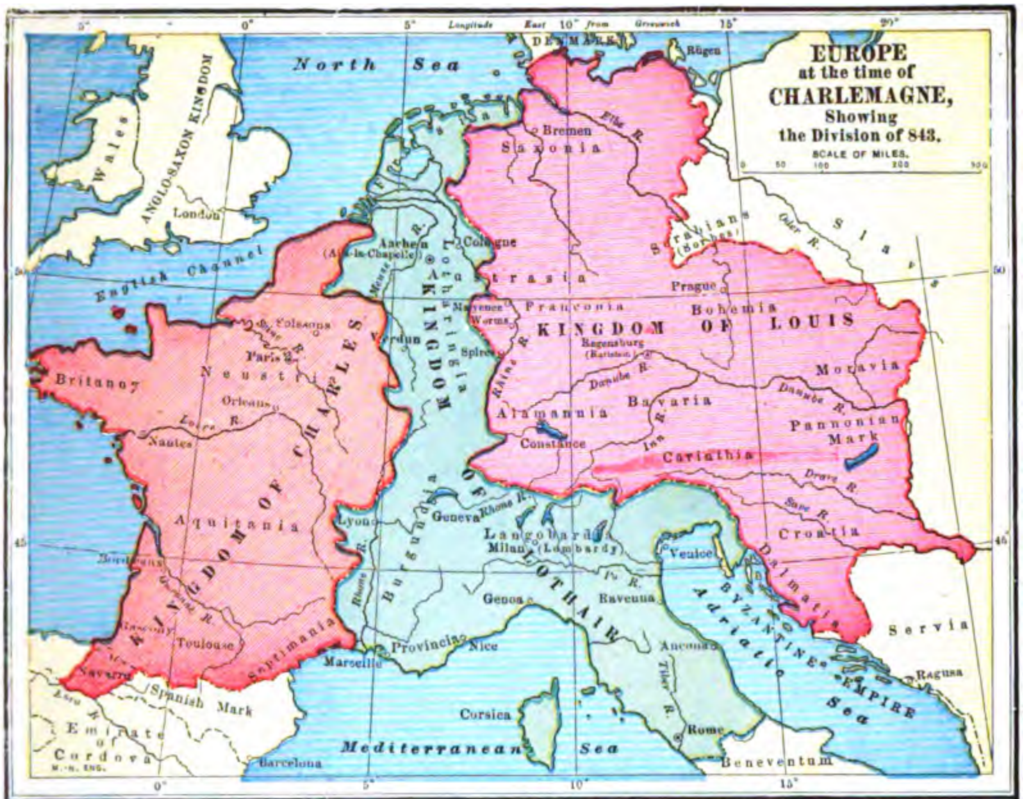
Roman Civilization. Inferior to the Greeks in alertness of mind and in versatility, but superior in poise and in judgment, the Romans slowly developed a civilization of a higher type in matters of government and law. They first devised a working combination of power and freedom. In the third century B.C. Rome had made herself mistress of Italy; when, in the struggle with Carthage (q.v.), she added sea power to her land power, she was able to extend her authority over the entire basin of the Mediterranean. After the conquest of Greece (146 B.C.) the Greek culture became dominant at Rome in art, letters, and philosophy; and the civilization which the Roman Empire carried into lands heretofore barbarous was a Græco-Roman civilization. In the eastern portion of the Empire, the direct influence of Greece was naturally greater; in the western portion, that of Rome. In west and central Europe the Greek culture was introduced and perpetuated, until the fourteenth century, mainly through the Latin imitations and adaptations of Greek forms and Latin popularizations of Greek thought, and the original Latin productions, that sprung out of a study of Greek culture. The third great force that has shaped modern Europe, Christianity, was sensibly affected by Greek thought and Roman institutions. Paul and the early fathers, trained in the learning of the Greeks, put the doctrines of the new religion into the form best adapted to appeal to the Græco-Roman world; the formulation of its dogmas was sensibly influenced by Roman legal ideas; and the hierarchic organization with which the Christian Church came into mediæval Europe was modeled on the administrative system of the Roman Empire. If it is broadly true, as Maine has said, that the modern civilized nations are those that derive their law from Rome, their art from Greece, and their religion from Judæa, it is also true, as Freeman has said, that "of all European history Rome is the centre"; for the Roman Empire summed up the chief results of the ancient civilization and transmitted them to the modern world. See ROME; CHRISTIANITY; CIVIL LAW.

Europe Under the Roman Empire. Under Augustus the Roman Empire attained the boundaries which it successfully defended for four centuries. (See Map of the Roman Empire, under ROME.) In Europe these were the Rhine and the Danube, and the territory between the upper courses of these rivers. In only two directions was there subsequent expansion. During the first century the greater part of Britain was subdued (see BRITANNIA); and at the beginning of the second century the territory beyond the lower Danube, Dacia (modern Rumania), was organized as a province and held for 170 years. (See TRAJAN.) Military roads and fortified camps not only facilitated the defense of the Empire, but stimulated trade and the growth of cities. Except in the most mountainous regions, the barbarians whom Rome had subjugated gradually accepted the Græco-Roman civilization. In Spain and Gaul and in the British cities Latin supplanted the native languages. From the close of the first century the provinces supplied the Empire with the majority of its civil and military officers and with nearly all its emperors. Through this increasingly homogeneous Empire the Christian religion made rapid progress; and when in the fourth century Christianity became the state religion, the provincials accepted that creed which had finally obtained the recognition of the Imperial court—the creed formulated by Athanasius (q.v.). Of the barbarians beyond the Roman borders, the nearest and most dangerous were the Germans. The almost incessant conflicts which were necessary to hold the line of the Rhine and the Danube forced Rome steadily further into military monarchy, until, under Diocletian (q.v.), the Empire was reorganized on lines which contemporaries regarded as "Persian." The burden of a great standing army, bad management of the Imperial finances, and an elaborate system of state socialism impoverished the Empire, and its native population diminished. In order that the soil might be tilled and the legions kept at full strength, barbarians, especially Germans, were imported in increasing numbers. At the time of Augustus the population along the west bank of the Rhine was substantially German. In the following centuries German captives were settled in Britain, in Gaul, in Italy, and in the Danubian provinces, at first as serfs, but after the close of the third century as tributary communities. From these and from tribes across the frontier in alliance with Rome, an increasing proportion of recruits was drawn, until in the fourth century the legions settled on the frontier were largely composed of Germans. After Constantine Germans rose to the highest positions in the army and the central administration, and "the last century of Roman history may boldly be characterized as the century of German rule." (Brunner.) Upon the Germans beyond the frontier the most important effect of these centuries of conflict was the gradual formation of those larger tribal unions which in the fifth century overthrew the West-Roman Empire and divided among them its provinces. The tribes in closest contact with Rome were converted to Christianity in the fourth and fifth centuries. The missionaries who accomplished this work were followers of Arius (q.v.), and the Germans retained the Arian creed after the emperors and the church councils had accepted that of Athanasius. See GERMANIA; GOTHS; HUNS; ROME, *The Roman Empire.*

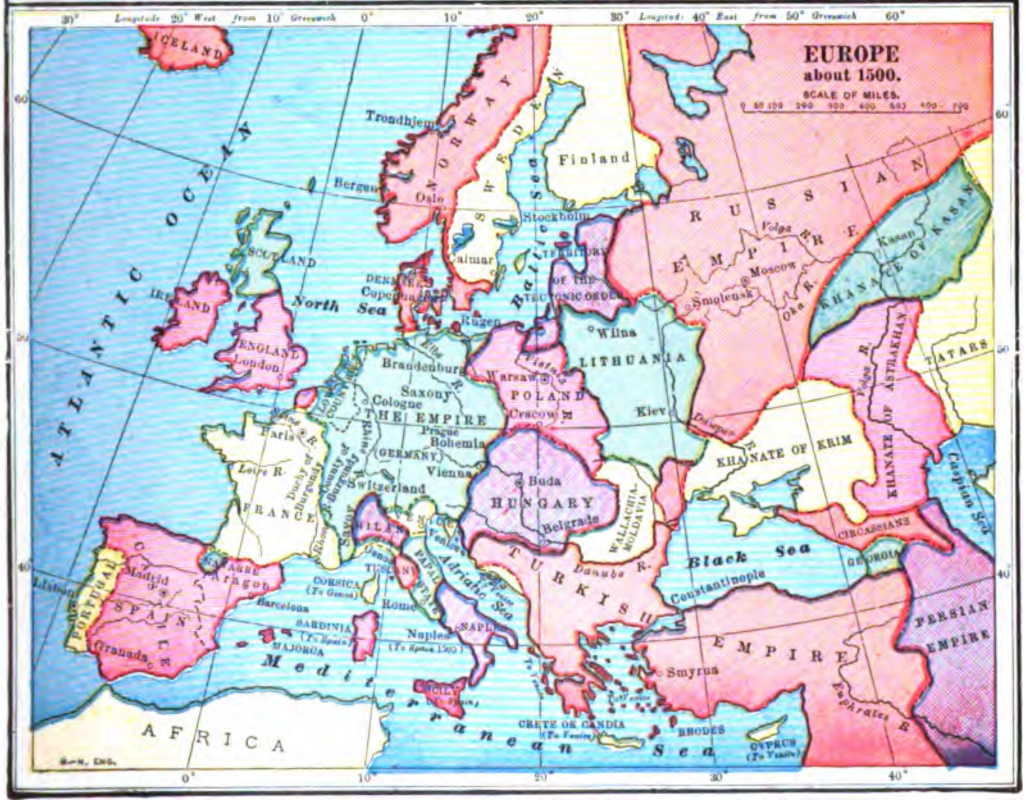
The Barbarian Kingdoms. It was the beginning of the end of the old order when, at the close of the fourth century and the beginning of the fifth, whole German tribes were settled within the frontier as allies of Rome, on the condition that they should hold back the tribes behind them. The incursions of the Huns (q.v.), which threw eastern and central Europe into confusion, hastened the destruction of the Empire. In the fifth century the frontier was lost: the Germans and the Huns broke through all along the line. (See MIGRATION.) At the close of the fifth century Saxons, Angles, and Jutes had established kingdoms in eastern and southern Britain; Gaul was divided between Franks, Burgundians, and Visigoths; Spain between Visigoths and Suevi; northern Africa and the islands of the western Mediterranean were occupied by Vandals; and Italy, where a German leader of mercenaries (see ODOACER) had deposed the last West-Roman Emperor, had passed, with all the territory between the middle Danube and the Adriatic, under the rule of the Ostrogoths. (See BURGUNDY; GOTHS; SUEVI; VANDALS; ETC.) To the Roman provincials (except in Britain) the change of conditions must have seemed slight. They had often been ruled by German officials, and the German kings who now ruled them held official titles conferred by the Emperor at Rome or the Emperor at Constantinople. The Romans remained free, and in their disputes with each other they were still governed by Roman law. The Burgundian and Visigothic kings caused manuals of Roman law to be compiled for the benefit of their Roman subjects. Theodoric (q.v.), King of the Ostrogoths, issued a similar compilation, by which Goths as well as Romans were to be governed. Each provincial landholder was, indeed, compelled to surrender to a German a part of his estate and slaves; but under the Empire German soldiers had been quartered on the provincials, and contributions had been exacted for the support of the soldiers. From such contributions the Romans were now freed. The chief cause of friction between the German kings and their followers on the one hand and the Roman provincials on the other lay in the fact that the former were generally Arian heretics. The resultant disaffection was a serious element of weakness in the kingdom of the Goths, Burgundians, and Vandals. Early in the sixth century the newly converted and orthodox Franks defeated the Visigoths and the Burgundians and brought under their control all Gaul except the Mediterranean coast. (See CLOVIS; FRANKS.) Later in the same century the armies and fleets of the orthodox Justinian overthrew the kingdoms of the Arian Vandals and Ostrogoths and wrested southeastern Spain from the Visigoths, so that for a few years the Mediterranean was again Roman. (See JUSTINIAN; BELISARIUS; NARSES.) Before the close of the century the Visigoths and the Suevi, whose realm the Visigoths had annexed, abjured their heresies, and in Visigothic Spain the clergy became all-powerful. In 568 the Arian Longobards, or Lombards (q.v.), conquered north and central Italy; but this tribe also accepted the orthodox faith in the middle of the seventh century. The scattered settlement of the German conquerors among their Roman subjects favored a fusion of races, and the chief obstacle to fusion disappeared when the Germans became orthodox Christians. Of all the kingdoms founded by the Germans on Roman soil, that of the Franks became the most powerful and proved the most durable, because the Franks retained, as the central point of their power, their old home on the lower Rhine, and because the expansion of their rule over Gaul and later over Italy was accompanied by expansion over purely German territory. At the close of the fifth century the Franks conquered the Alemanni and in the sixth the Thuringians and the Bavarians.

The Arabs. In the seventh century Christendom was forced into a struggle for existence against the hordes of Arabia, fused into a fighting unit by a new religion,—Mohammedanism. Within a generation after the Hejira (622 A.D.) the Arabs had destroyed the Kingdom of the Sassanides in Persia, had wrested from the Greek Empire Syria, Armenia, Cyprus, Crete, and Egypt. Before the close of the century they were overrunning north Africa. A few years later they were besieging Constantinople. The Greeks, though hard pressed by Asiatic hordes north of the Balkans, nevertheless beat off the Mohammedan attack and maintained a hold on Asia Minor. Early in the eighth century the Arabs, now in complete control of north Africa, defeated the Visigothic forces (711 A.D.) and conquered all Spain except the mountainous northern regions. Pressing into Gaul, they were defeated by the Franks in 732.

The Frankish Empire and the Papacy. The German-Gallic Kingdom which the Franks had built up in the fifth and sixth centuries was threatened in the seventh century with dissolution. The royal power was hereditary, but all the sons of the king had equal rights of inheritance. The resulting partitions were indeed temporary; by wars and by deaths the realm was repeatedly reunited; but in these struggles the territorial magnates gained increasing independence, while the degeneracy of the reigning house diminished its authority. (See MEROVINGIANS.) The power that was slipping from the hands of the Merovingians was, however, grasped by new rulers, Arnulfings or Carolingians (q.v.), who, first as mayors of the palace, later as kings, reëstablished the royal power, and in the eighth century widened the Frankish kingdom into an empire. As in the earlier stages of Frankish expansion, the acquisition of new Romanic territory (part of Italy and northeastern Spain) was balanced by conquests of other German tribes (Frisians and Saxons). Even more than the Merovingians, the Carolingians identified their dynastic interests with those of the orthodox Christian Church. They carried the gospel among the heathen Germans with the sword, converting as they conquered. They drove the Arabs back across the Pyrenees (see CHARLES MARTEL and PEPIN THE SHORT under PEPIN) and extended the boundary of Christendom to the river Ebro. Throughout their realms they supported with ready assistance the supreme authority of the Pope in ecclesiastical discipline; and when they interfered to protect him against the Lombards they gave to him a strip of central Italy, reaching from Ravenna to Rome, and thus laid the basis of the temporal power which the popes held until 1870. (See DONATION OF PEPIN; PAPAL STATES.) The sovereignty of the Emperor at Constantinople, which the Roman pontiffs had previously recognized, was from this time denied. (See PAPACY.) In return for their services to the church, the Carolingians received aid from the popes in political matters. The papacy helped to transform Pepin from mayor of the palace into King (751 A.D.), and Charles the Great from King of the Franks and the Lombards into Emperor of the Romans (800 A.D.). The tradition of the Roman Empire, the idea that all Christians should be subject to one secular lord, the Emperor, was still a force; and when Charlemagne had made himself supreme in the Western Christian world, and the Imperial dignity had passed at Constantinople to a woman (Irene), it seemed to Western Christendom a natural thing that its ruler should be recognized as the successor of the Roman Cæsars. Through the harmonious coöperation of church and state, in the Empire of Charlemagne, the political, religious, and literary influences that had come down from the



EUROPE at the time of CHARLEMAGNE, Showing the Division of 843.



EUROPE about 1500.

ancient world were for the last time focused; and from the Frankish Empire these influences were transmitted, with certain permanent modifications, to the new and separate nations which took its place. Of the new institutions that took shape in the Frankish Empire the most important was feudalism. Feudalism had many roots, some of them Roman; but the growing feudal institutions received a great impetus when Charles Martel, in order to meet the Arab horse with Christian cavalry, gave benefices on the tenure of knight service. The knight fees which he created were to a large extent carved out of church lands; and the church was drawn into the feudal system. See Charles the Great; Feudalism.

Europe at the Time of Charlemagne. (See Map: Europe at the Time of Charlemagne.) The Empire of Charles the Great included all Christian Europe except the British Islands, where the German invaders had been converted in the seventh century; northwest Spain, where Christian chieftains of Gothic or Suevic blood were holding out against the Arabs; and the Greek Empire. The Danes and Scandinavians on the north, the Slavs and Avars on the east, were still heathens. The Frankish Empire included all the German tribes of central Europe; but it did not include all the territory of modern Germany, since its northeastern frontier ran between the Elbe and the Oder. The other important European powers were the Greek Empire and the Emirate of Cordova. The territory north of the Balkans had fallen into the hands of Slavic and Asiatic hordes (Servians and Bulgarians); but the Emperor at Constantinople still ruled the rest of the Balkan Peninsula, together with south Italy, some of the islands of the Mediterranean, and the greater part of Asia Minor. The Greeks still had sea power, and the trade between Europe and the Orient was mainly in their hands. Until after the Crusades their coin, the "besant," was the standard of Mediterranean values. South of Christendom, from Spain through north Africa to Syria, curved the crescent of Islam. In the west, where the emirs of Cordova had made themselves independent of the caliphs at Bagdad, Mohammedanism had reached the limit of its forward movement; but in the islands of the Mediterranean, in Asia Minor, and in southeast Europe it was still to win ground from the Greeks. Placed in touch with the Greek civilization in Syria and in Egypt, Islam was developing, in letters and in science, a culture which, until nearly the close of the Middle Ages, was superior to that of western Europe. See Saracens.

Dissolution of the Frankish Empire. Beginnings of the Modern European Nations. The power of Charles the Great's successors was undermined by the growing independence of the local magnates, particularly of those who held the offices of count or of margrave. These offices, as well as the domains that went with them, were coming to be regarded as fiefs and, like other fiefs, were becoming hereditary. Some magnates whose feudal authority extended over several counties were coming to be called dukes. In the German territories some of these dukes ruled over tribes, like the Bavarians and the Saxons, and were in a sense successors of the tribal kings whom the Franks had suppressed. The great prelates, too, were becoming independent, and in many cases bishops and abbots received the secular powers of counts. The Empire was weakened also by the attacks of Slavs and other barbarians on its eastern frontier, of Arabs in Italy, and of Scandinavian pirates on all its northern and western coasts. The immediate cause, however, of the disruption of the Empire was the division of the Imperial territory among all the sons of the Emperor. In order to maintain as far as possible the unity of the Empire, a compromise was proposed: Arrangements were made by which each son should receive as King a part of the Empire, but a larger part with a superior authority should go to the eldest son as Emperor. Wars followed, and in these the old Frankish principle triumphed. In 843 the Empire was divided into three shares. (See Verdun, Treaty of.) Although this division lasted but 27 years, the name of a part of the middle kingdom, Lotharingia, still survives in the modern Lorraine. Some 40 years after the partition of Verdun, all the Carolingian territories were for a short time reunited under Charles the Fat; but after 887, when Charles the Fat was deposed, France and Germany were permanently separated; there were two independent Burgundian kingdoms, and Italy was separate, but not united. In the north of Italy there were kings, some of whom were crowned emperors; in the middle were the possessions of the papacy; in the south Lombards, Greeks, and Arabs were fighting for control and territories. In France and in Germany descendants of Charles the Great reigned for a time; but in the tenth century other kings, not of the Carolingian stock, were set up by the territorial magnates. Of these new kingdoms Germany was by far the strongest. The Northmen pirates were beaten off from its coasts, and the Danes were pushed back into Jutland. The Hungarians, who had kept central Europe in turmoil during the first half of the tenth century, were defeated and confined to approximately the territory which they still occupy. The Slavic Kingdom of Poland recognized German suzerainty; the Slavic peoples of Bohemia and Carinthia were incorporated into Germany. The debatable land to the west of the Rhine (Lorraine) and the greater part of Italy were brought under the overlordship of the German kings in the tenth century; Burgundy was annexed in the eleventh. With the reëstablishment of German authority in Italy (962) the German kings assumed the Imperial title. See Holy Roman Empire.

Second only to Germany's influence during these centuries was that of the Scandinavians. In the latter half of the ninth century the Swede Rurik established among the eastern Slavs the kingdom which became Russia, and the Danes conquered half of England. In the tenth century the Norsemen obtained possession of a part of north France, founding there the Duchy of Normandy. In the first half of the eleventh century the Danish King Canute reigned for a few years over an empire which included all England and the greater part of Scandinavia; and England escaped from the rule of the Danes only to fall, within a score of years, under that of the Normans. In the same century Norman knights gained control of south Italy and Sicily. (See Normans; Varangians; Guiscard.) Of all the national states that were in process of formation at the close of the eleventh century, England alone had a strong central government, and this only after the Norman Conquest. France and Germany each had a king, but the king was only the first among his peers; the real power was, in France always, in Germany sometimes, in the hands of the great nobles and prelates. The same was true in Italy and in the Christian states that were taking form in north Spain; and in neither of these peninsulas was there even the nominal unity of a single national kingship. In Spain and in Italy, however, as in France, separate and fairly homogeneous nationalities were developing. Goths and Franks, Burgundians and Lombards, had intermarried with the Roman provincials and had adopted their speech; and on the basis of the vulgar Latin of each province, new national languages had already been formed. The Scandinavian conquerors also, who came five centuries later, lost their racial identity and became French in France, Italians in Italy, Russians in Russia. In all the larger countries of west and south Europe, however, there were marked local differences in dialect and in customs, and broader differences between the northern and southern districts. In general, throughout the Middle Ages, national feeling was weak. The strongest ties were those of locality and of class, and the classes were not national, but European. At the close of the eleventh century the peoples of north and east Europe were coming under the influence of Christian civilization. The only important regions not already reclaimed from heathenism at the end of the century were those south and east of the Baltic, inhabited by Pomeranians, Prussians, Lithuanians, Livonians, etc. The Scandinavians, the western Slavs (Poles and Bohemians), and the Hungarians received Christianity from the Roman church, and were thus drawn into the West-European body of nations. The Servians, Bulgarians, and Russians, on the other hand, were converted by Greek missionaries and constitute to this day, with the Greeks, a distinct East-European group.

Increasing Power of the Church. After the disruption of the Frankish Empire the unity of Western Christendom was visibly represented only in the Roman church. The church had supported the Carolingian Empire and had striven to avert its destruction. When this became inevitable, the church naturally secured as much as possible of the Imperial inheritance. The unity for which it stood was in no wise confined to matters of faith and worship. The church represented the learning of the age and had complete control of education. It was the recipient and administrator of charitable trusts; it cared for the sick and infirm and relieved the poor. It interpreted and enforced by penalties rules of morality, and by reason of the intimate connection between morals and law, and between its sacraments and the whole social life, it exercised a somewhat indefinite but very wide jurisdiction over matters which are to-day regarded as legal. (See CANON LAW.) To this jurisdiction every Christian was thought to be subject, from the peasant to the king. The church thus discharged many governmental functions which the mediæval state was too crude and too feeble to undertake. It was in reality an ecclesiastical state, and it possessed a governmental organization and a governmental *personnel* far superior to that of any contemporary secular state. For the efficient discharge of its duties the church deemed it necessary that its agents, from pope to parish priest, should be independent of the secular powers. It had partially succeeded in exempting its clergy from secular jurisdiction, but it had not obtained full freedom in the selection of its officials. The Pope, as Bishop of Rome, was chosen by the clergy and people of Rome. In the tenth century the Roman nobles controlled the papal elections, and the character of the popes whom they selected was such as to deprive the office of much of its dignity and authority. In the eleventh century the German emperors brought about a reform; they secured the deposition of unworthy claimants and the election of worthy German successors; but this Imperial interference was a fresh menace to the independence of the church. The local authorities of the church, the bishops and the abbots, were likewise elected by the clergy of the cathedral chapters and of the monasteries; but as the lands of the church were held as fiefs and the prelates were feudal vassals, the secular overlord naturally endeavored, and usually with success, to control the election of these authorities. The attempt of the great Pope, Gregory VII, to deprive feudal superiors of all influence upon the choice of bishops and abbots brought the papacy into conflict with the German emperors. In this conflict the emperors were supported by many of the German prelates whom they had practically appointed, while the popes were supported by most of the secular princes of Germany, who desired to weaken the Imperial power at home. (See INVESTITURE; GREGORY VII; HENRY IV; SAXONY; PAPACY.) The terms on which the conflict was ended (Concordat of Worms, 1122) were a compromise, defining more clearly the ecclesiastical and feudal rights. In the eleventh century, however, the basis was laid for the greatly increased power which the church exercised in the thirteenth century. The selection of the head of the church was intrusted to a body, the College of Cardinals, created by the head of the church. The interest of the feudal superior in the control of church elections was somewhat diminished by renewed prohibition of the sale of ecclesiastical preferments (simony) and by making it more difficult for those prelates who bought preferment to keep it. Finally, the renewal and attempted enforcement of the rules prohibiting the marriage of the clergy sought to secure for the church a body of servants removed as far as possible from all influences except her own. (See CELIBACY.) From the eighth century, when the Roman pontiffs denied the temporal sovereignty of the Emperor at Constantinople, the Eastern church, under the influence of the emperors and already tending to separation on account of disciplinary distinctions, drifted away from the Roman church. The separation became definite and final, in the eleventh century, in consequence of a doctrinal difference concerning the Procession of the Holy Ghost. The Eastern church never became independent of the secular authority, and its dependence facilitated the development of national churches. See BYZANTINE EMPIRE; GREEK CHURCH.

Age of the Crusades. In Spain the kings of León had gradually reconquered a fourth part of the peninsula, the Byzantine Empire had regained some of its territory, part of Italy had been wrested from the Moslems; but, on the whole, Christian Europe had remained for nearly three centuries on the defensive against Islam. In the eleventh century a new and ruder people, the Seljuk Turks, became dominant in Mohammedan Asia, maltreated Christian pilgrims, and conquered Asia Minor (1071). At the appeal of the Greek Emperor, Pope Urban II called Christian Europe to arms (1095); and before the close of the century a great host of Crusaders had marched through Asia Minor and occupied part of Syria, establishing there a kingdom of Jerusalem and other principalities. (See CRUSADES.) The struggle thus opened continued for two centuries. The retainers of the Christian princes in Syria and the military monks (see HOSPITALERS; TEMPLARS, KNIGHTS; TEUTONIC KNIGHTS) constituted the standing army of the Christians; repeated crusades from all parts of Europe brought volunteer assistance. This phase of the struggle ended at the close of the thirteenth century with the evacuation of Syria by the Christians. An episode of the Crusades was the temporary overthrow of the Greek Empire (1204) by French Crusaders in alliance with Venice. A Flemish count (see BALDWIN I) was made Emperor at Constantinople, and the European territories of the Empire were divided between Venice and individual leaders. Greek emperors, meanwhile, continued to reign in Asia Minor; and in the latter half of the century, with the aid of the Genoese, one of them recovered Constantinople (1261) and part of the former possessions. The Venetians, however, kept much of the territory they had acquired, and became the leading commercial power in the eastern Levant; although the Genoese, on better terms with the Greeks, had control of trade in the Black Sea. The only permanent gains made by Christendom during these centuries were in Spain and on the Baltic. War against the heathen in these places also was regarded as a crusade. By the middle of the thirteenth century the Christians had conquered all of Spain except Granada; the Teutonic Knights had subdued and converted the Prussians; and another body of military monks, the Brethren of the Sword, were doing the same work in Livonia and Esthonia. In this same century, however, Christendom lost ground in eastern Europe through the conquest of Russia by the Mongols. See MONGOLIAN RACE.

The Papacy and the Western Empire. During these centuries the papacy, which had obtained the leadership of Christendom in the warfare for the Cross, attained its greatest power. The popes made and deposed kings, accepted whole kingdoms as fiefs of the church, and exercised jurisdiction in international controversies. The German emperors of the house of Hohenstaufen (1138–1254) seemed indeed almost as powerful as their predecessors of the eleventh century, who had made and unmade popes; and when by marriage the emperors gained control of the Norman Kingdom of Naples and Sicily, the independence of the papacy appeared to be seriously menaced. Among the German princes, however, and in the Lombard cities the popes found trustworthy, because interested, allies; and a century of intermittent conflict ended in the destruction of the Hohenstaufen dynasty. See GUELPHS AND GHIBELLINES; HOHENSTAUFEN.

Europe at the End of the Crusades. At the close of the thirteenth century Germany and Italy had become aggregations of practically independent principalities, secular or ecclesiastical, and of free cities. Kings were elected in Germany, and these kings called themselves Roman emperors; but they had almost no power in Italy and little in Germany. Poland and Hungary were no longer even nominally subject to the Empire, and Burgundy was drifting to France. In the northeast, however, Germany had expanded by Saxon conquests and colonization, and the gains thus effected proved more durable than those made by the military monks. The kings of England had retained Normandy through the twelfth century and had acquired by marriage so many other fiefs that they ruled more than half of the French territory; but all these possessions except Guienne had been lost by the unlucky John early in the thirteenth century. In France, as in England, the crown had become hereditary, and at the close of the thirteenth century the power of the French kings was increasing. In Spain the united Kingdom of León-Castile (in which also the royal power was increasing) covered the greater part of the peninsula; but Portugal, independent since 1140, had attained its present boundaries, and all eastern Spain was ruled by the King of Aragon. During these centuries there was a great increase of commerce in west Europe. The control of European trade with the East passed out of the hands of the Greeks into those of the Italians, and a much more active traffic was developed on the trade routes between the Mediterranean and northern Europe, especially on those that ran through Germany. The result was a great increase in the wealth and power of the cities, first in Italy, later in Germany, France, and Spain. Everywhere the citizens bought or fought themselves free from their ecclesiastical or secular lords; in many parts of Europe the cities formed alliances for mutual protection. The league of the Lombard cities played an important part in the struggle between the popes and the emperors; the great league of the Hansa, which soon controlled the trade in the northern seas, was formed before the close of the thirteenth century. (See HANSEATIC LEAGUE.) It was a natural result of the increasing importance of the cities that their representatives were summoned to meet with the other estates of the realm in diets or parliaments. This occurred in the Spanish kingdoms in the twelfth century, in England and in Germany in the thirteenth century, and in France at the beginning of the fourteenth century. In the intellectual life of Europe the universities played an increasingly important part. The age of the Crusades was also the age in which scholasticism reached its highest development. It was also the age in which the study of the law books of Justinian was revived, and in the legists a new learned class appeared from which the kings and princes, heretofore dependent upon the clergy for their administrative officials, were able to draw servants more devoted to their interests. The cities furnished the wealth and power which in the following centuries made the monarchy independent of the feudal nobility; the legists formulated the theories and furnished the trained service which was to make the modern state independent of pope and church.

Changes during the Fourteenth and Fifteenth centuries. The consolidation of France was interrupted by a series of wars in which the English kings strove to make themselves kings of France also. (See HUNDRED YEARS' WAR.) In the fifteenth century, in alliance with Burgundy, Henry V of England came near accomplishing this end. The French dukes of Burgundy had obtained control of the Netherlands and aimed to establish an independent middle kingdom. (See BURGUNDY.) In 1435, however, Burgundy made peace with France, and within a score of years England had lost all its conquests except Calais. After the death of Charles the Bold of Burgundy, in conflict with the Swiss (1477), the greater part of the Netherlands passed, by marriage, to the Austrian house of Hapsburg, but Burgundy was annexed to France. By the union of Castile and Aragon (1479), and the conquest of Granada (1492) and of Spanish Navarre (1512), Ferdinand the Catholic became ruler of the entire Spanish peninsula, except Portugal. Thus, France and Spain came out of the Middle Ages as well-rounded national states. In each the crown was hereditary, and the royal authority was becoming supreme. In central Europe the conditions were very different. In Germany the emperors were chosen first from one house and then from another, that no precedents for hereditary succession might be created; and each emperor used his position to increase the territorial power of his own house. After 1438, indeed, emperors were regularly taken from the Hapsburg family, but this change of policy indicated only that the other territorial princes had become too strong to apprehend any revival of the Imperial power. Thus weakened, the Empire began to lose territory on every side. In the fourteenth century the Swiss became practically independent of the Empire; in the fifteenth they became a factor in European politics. In the latter century Burgundy passed definitively to France; Schleswig and Holstein were brought into personal union with Denmark; and the Prussian possessions of the Teutonic Order were partly annexed by Poland and partly held as fiefs from the Polish crown; Italy remained divided, for it was the policy of the popes to prevent any single state from obtaining a predominance which would threaten the independence of the Papal States. The wealth and weakness of Italy naturally attracted the stronger western states. Since the overthrow of the Hohenstaufen, Aragonian princes had ruled in Sicily and French princes at Naples. In the first half of the fifteenth century Aragon obtained control of both regions. Before the close of the century Charles VIII had invaded Italy to enforce the French claims to Naples, and the struggle for the control of the peninsula was opened. In the north and east of Europe, as in the west, larger political unions were forming. At the close of the fourteenth century all the Scandinavian countries were brought by the Calmar Union under a single ruler, and Norway remained united with Denmark until 1814; but Sweden was largely independent during the fifteenth century and became wholly independent in the sixteenth. In the latter part of the fourteenth century Poland was united with the recently Christianized Lithuania, and became, in territorial extent at least, an important state, stretching from the Baltic to the Black Sea; but the elective Polish monarchy never developed sufficient power to make this Slavic state permanent. At the close of the fifteenth century Russia freed itself from subjection to the Mongols. The most important event of this period, however, was the overthrow of the Greek Empire. In the middle of the fourteenth century the Ottoman Turks, having subdued Asia Minor, attacked the European territories of the Empire; before the end of the century they had conquered nearly all of the Balkan Peninsula, and in 1453 they took Constantinople by storm. Long decadent, the East Roman Empire had, nevertheless, outlived the West Roman for nearly a thousand years; and it had held against Islam the southeastern gate to Europe for more than seven centuries. (See Map: EUROPE ABOUT THE YEAR 1500.)

Close of the Middle Ages. Intellectually and spiritually the closing centuries of the Middle Ages represented ferment and growth. Renewed acquaintance with the literature of the ancient world (see HUMANISM) widened the narrow horizon of mediæval thought. The invention of printing immensely accelerated the diffusion of new ideas. The basis of political power also was shifted. The invention of gunpowder completed the change begun by English bows and Swiss pikes; it destroyed the military superiority of the armored horseman and the power of the feudal nobility. The opening by the Portuguese of the sea route to India, and the discovery, under the auspices of Spain, of a new world in the west, signified primarily for modern Europe the opening of new sources of wealth, and an increase of the power of the burgess class and of the crown. Later it was to signify the expansion of European civilization over the world; and, last of all, the subordination of European politics to world politics. At the close of the thirteenth century the power of the papacy had begun to decrease. England and France were already asserting, as other countries were later to assert, the right of the state to limit ecclesiastical jurisdiction and taxation and the taking of land into the "dead hand." (See MORTMAIN, STATUTES OF.) Early in the fourteenth century the French kings brought the papacy under their control, and for 70 years the popes were in exile at Avignon. Other popes were set up at Rome. The schism was ended by church councils in the fifteenth century, but reforms proposed by the councils were not carried into operation. Reformation through revolt found its leaders in Wiclif and Huss, and the attempt to crush the Hussite revolt led in the fifteenth century to a long and bloody war. See WICLIF; HUSS; HUSSITES.

The Period of the Reformation and the Religious Wars. The struggle between France and Spain for supremacy in Italy may be regarded as the beginning of the modern period of international politics. The Reformation (q.v.), by completing the disintegration of the Holy Roman Empire and dismembering Germany, made this country, too, a plaything for the ambition of other powers; it shifted the centre of European intrigue and conflict from south to north Europe. The expansion of firmly governed nations at the expense of nations lacking a strongly centred authority is perhaps the most marked feature of the succeeding period. Thus, France and Sweden grew at the expense of Germany, and later Prussia, Austria, and Russia grew at the expense of Poland, and Spain grew at the expense of Italy. The election of Charles I of Spain as Emperor in 1519 led to a protracted war with Francis I of France. In view of the overwhelming power of Charles, who, in addition to the Imperial title, united in himself the sovereignty of Spain with Naples and Sicily, the Austrian possessions of the Hapsburgs, and the enormous wealth of America and the Low Countries, the war assumed for Francis the character of a struggle for self-preservation.

Francis was fighting for nationalism and Charles for internationalism. (See CHARLES V; FRANCIS I.) The odds against the French King, however, were not so great as they seemed. He could depend upon the united strength of a firmly jointed nation; whereas Charles's multifarious interests and the very extent of his domains exposed him to attack from many sides. The Turks, the Protestants, the Pope at different times prevented Charles from bringing all his resources to bear against France, and that country, though defeated in four wars, suffered little loss in the end. The nature of the Reformation Charles in the beginning entirely failed to understand, and he neither made himself the leader of it nor did he consistently attempt to repress it. He thought he had settled the German difficulties by the Edict of Worms (1521). Protestantism, unmolested before 1530, spread rapidly over north Germany—originating, no doubt, in the prevalent abuses and laxness of discipline in ecclesiastical affairs, but finding favor, too, with the princes and knightly classes, whose anarchic ambitions it tended to confirm. After 1530 all efforts on Charles's part to stamp out the progress of the Reformation were vain; and though the victory of Mühlberg (1547) over the German Protestants seemed for a moment to make him master of the Empire and of west Europe, he was compelled during the last years of his reign to make his peace with the Protestants (Passau and Augsburg) on the terms of *cujus regio, ejus religio*, and to see the French King actually the master of German soil (Metz, Toul, Verdun, 1552). With his abdication his huge Empire fell apart. The Imperial dignity was assumed by his brother Ferdinand, and the throne of Spain with its possessions in Italy and the Netherlands went to Philip II. With the overweening power of the Hapsburgs reduced and the fabric of the Holy Roman Empire crumbling under the progress of the Reformation, France's opportunity seemed to have come. But France itself fell a victim to religious strife and exhausted its energies in civil warfare (see HUGUENOTS); and it was not until the genius of Henry IV (q.v.) had reunited all factions that France was able to revive the anti-Hapsburg policy of Francis I and Henry II. The wide-reaching plans of Henry IV were interrupted by his death, but they were taken up and put into execution by Richelieu (q.v.), who instituted the famous French policy of Catholic at home but Protestant abroad. Nor did France find its opportunity gone after the lapse of 60 years, for on the part of its rivals this had been a period of steady degeneration. The bigotry of Philip II brought on the revolt of the Netherlands (Briel, 1572) and the loss of the northern provinces; and the strength of the Spanish monarchy was exhausted in the struggle with the Dutch and in the crusade against England. (See ARMADA.) In the Empire a succession of rulers, acting in the spirit of the Counter Reformation (Rudolph II, Matthias, Ferdinand II), drove the line of cleavage between Protestants and Catholics deeper than ever, and finally, by their aggressions on the reformed religion, brought on the Thirty Years' War (q.v.). This was Richelieu's opportunity. Originally a conflict for religion between members of the Empire, the war, with the incursion of Gustavus Adolphus (q.v.), developed into a war for booty on the part of Sweden and France.

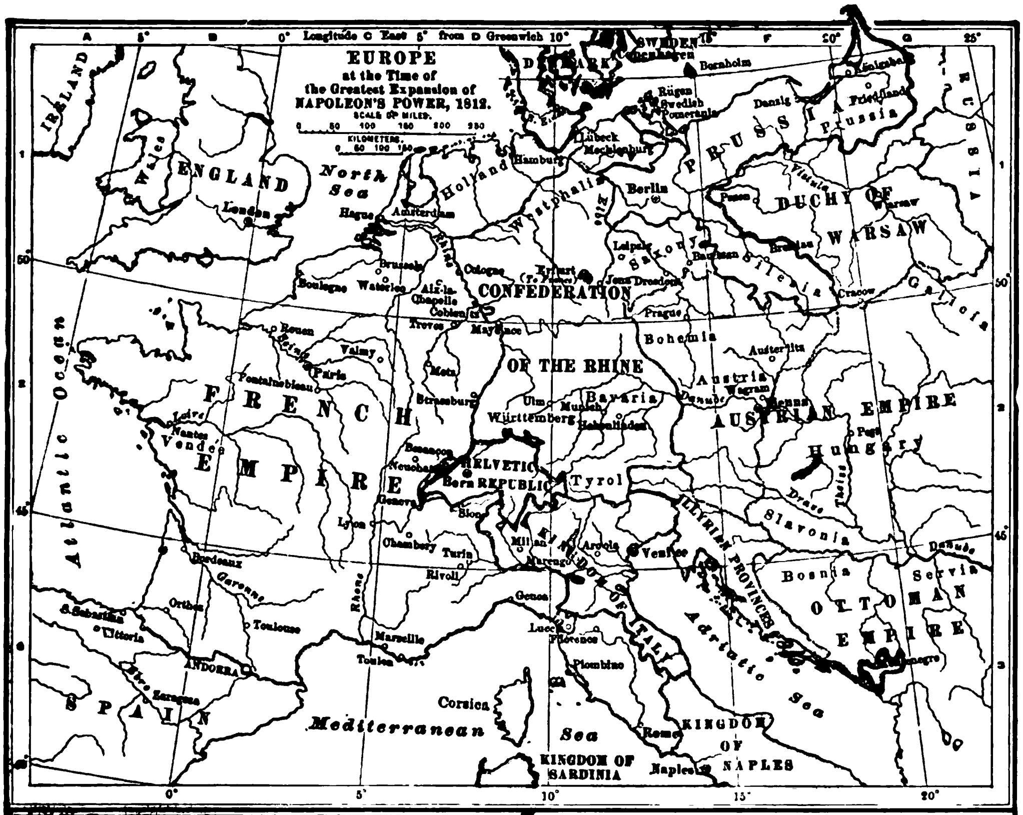
Europe in 1648. The Treaty of Westphalia (q.v.) confirmed the dismemberment of Germany by reducing the power of the Emperor to a shadow, by making the members of the Diet virtually independent, by erecting in Germany 266 secular states and 65 ecclesiastical principalities. Sweden gained extensive territories on the south shore of the Baltic, and France was confirmed in its possession of the three bishoprics, received territory in Alsace, and gained a foothold on the right bank of the Rhine. Westphalia left France the strongest power in Europe, and for a time France possessed in Sweden a powerful ally. Spain was forced to acknowledge the independence of the Netherlands and, though still retaining its Italian possessions, was moribund. The Emperor recognized the independence of Switzerland, and, with the increased power of the Diet, his authority became restricted practically to his personal dominions, whose safety was threatened by the Turks. These had become and were still the masters of the greater part of Hungary, with its capital, Buda. South Italy, the Italian islands, Milan and Mantua, were ruled by foreign masters. Poland was weltering in anarchy and fast slipping to its doom. Russia had not yet found a great ruler to bring it on the stage of European history.

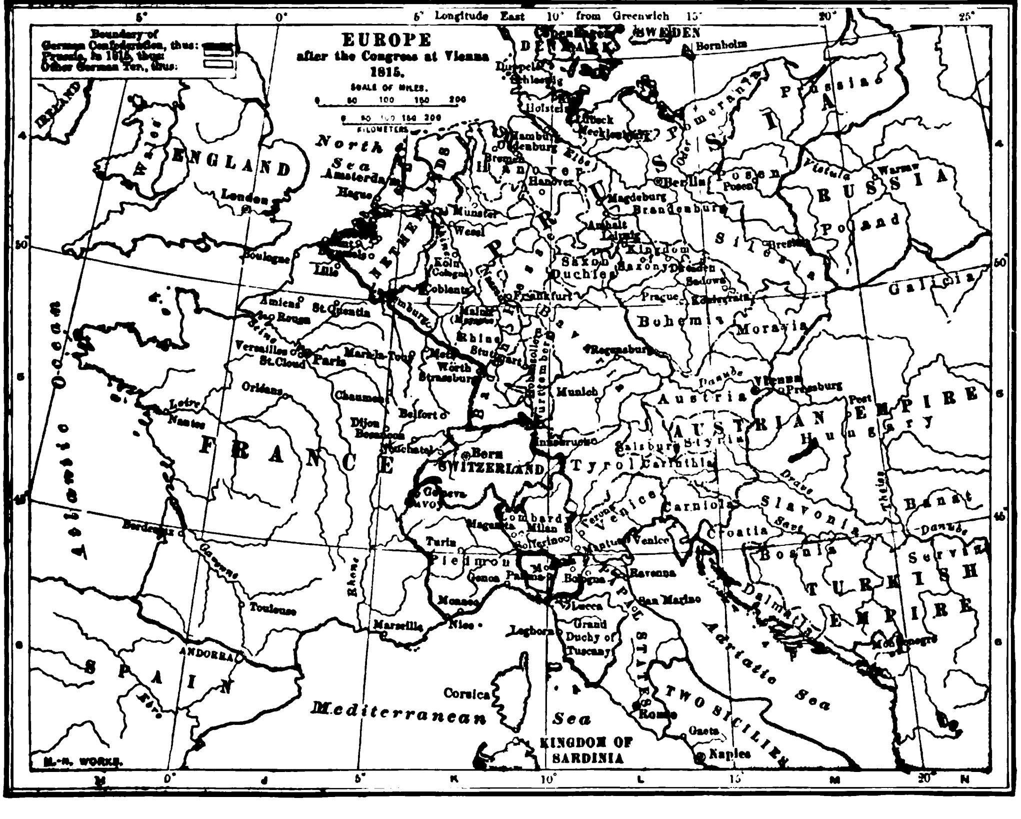
The Period of Dynastic Wars (1648–1763). From Westphalia to Utrecht international relations in Europe were dominated by the aggressions of France, which, after passing through a period of civil disorder (see FRONDE), attained under Louis XIV (q.v.) such power as to threaten for a time the other states of Europe with the same fate that France had feared from the power of Charles V. The European states were forced to unite against him—Holland, England, and Sweden in 1667; Holland, Spain, Brandenburg, and the Empire in 1672; Holland, England, Spain, Sweden, the Empire, Bavaria, and Saxony in 1689. In the course of these wars the theory of the balance of power was worked out in great detail, and the War of the Spanish Succession (1701–14), in which the French armies were repeatedly worsted, demonstrated the superiority of the state system of Europe to the power of any single state, no matter how strong. (See GRAND ALLIANCE.) The defeat of Louis XIV carried with it the overthrow of the Swedish power in Germany. Brandenburg, strengthened by its union with Prussia (1618), and under the astute guidance of the Great Elector (1640–88), had made common cause with the enemies of Louis XIV, and by its victory over the Swedes at Fehrbellin (1675) had entered upon its destiny as the successor of Sweden on the southern shores of the Baltic. While Louis XIV was battling against the Grand Alliance, Sweden was assailed by Denmark, Poland, and Prussia, and, in spite of its heroic King (see CHARLES XII), lost all of its possessions on the south shore of the Baltic with the exception of a small part of Pomerania; Prussia and Russia entering into its inheritance. The treaties of Utrecht (1713), Rastadt (1714), and Nystadt (1721) signalized momentous changes in the political balance of Europe, and things began to assume an aspect that is familiar. The power of France was checked by the aggrandizement of Austria, which now obtained possession of the Spanish Netherlands and became the dominant power in Italy. France lost the control of the sea to England, which entered upon a successful career of commerce and colonization.

Prussia was raised to the rank of a kingdom and stood forward as the leading state of north Germany. Russia under Peter the Great gained a foothold on the Baltic at the expense of Sweden. Savoy was made a kingdom and by the acquisition of Sardinia became a prominent factor in Italian affairs. The period that follows to the French Revolution was in general one of development on these lines. France, exhausted by the wars of Louis XIV and the excesses of his profligate successor, steadily declined in power in spite of a temporary success over Austria in the War of the Polish Succession (1733-35). Prussia, under the able and unscrupulous Frederick the Great (q.v.), assumed the leadership in Germany and held it in the great Seven Years' War (q.v.) against the united forces of Austria, France, and Russia. In this struggle Prussia received some aid from England; but England was more actively interested in world politics than in the continental politics, and to England fell the immense possessions of France in the New World and the ultimate control of India. Russia increased its territory at the expense of the Turks, who, after their great defeat at Vienna (1683), had rapidly been swept back, Carlowitz (1699), Passarowitz (1718), Kutschuk Kainardji (1774), marking the steady decline of their power. The greed for territory, since 1648, the moving spirit of European politics, reached its climax in the despoliation of Poland (1772, 1793, 1795) by Russia, Prussia, and Austria, acting under the inspiration of Catharine II.

Reform and Revolution (1763-1815). In the three decades of peace which followed the Seven Years' War the attention of European sovereigns was directed chiefly towards the internal problems of state. This was the age of benevolent despotism, when monarchs sought to reconcile the theory of absolute government with the new ideas concerning the rights of man emanating from France. Joseph II of Austria, Catharine II of Russia, Frederick the Great, Leopold of Tuscany, and Pombal in Portugal carried out far-reaching reforms in church and state without conceding any increased share in the government to the people. The states of Europe were thus mere governing machines rather than true nations, and they showed little stability when the outbreak of the French Revolution assailed the old form of things. In France (q.v.) the Revolution swept away all hereditary privileges and disabilities, destroyed monarchy, and for a time transformed the state into a confederacy of independent communes. The zeal of liberated France to extend to its neighbors the blessings of freedom, and the apprehensive hostility of the rulers of the monarchic states, brought on a series of European wars. The reaction in France against anarchy, and the stress of foreign conflict, made Napoleon (q.v.) absolute ruler of France, with governmental power more completely centralized than under the Bourbons. Napoleon's ambition converted the revolutionary wars into Napoleonic wars, and his military and political genius made him master of half of Europe. He took the title of Emperor of the French and regarded himself as the successor of the Frankish emperors. (See Map: EUROPE AT THE TIME OF NAPOLEON'S GREATEST POWER.) The Emperor in Vienna, who claimed the same position, surrendered his title in 1806, henceforth calling himself Emperor of Austria only; and thus ended the Holy Roman Empire, the most venerable and the emptiest of surviving mediæval institutions. To at least one of the principles of the Revolution Napoleon remained faithful. As far as his authority or influence reached, class distinctions were swept away, and all men became equal before the law. By independent legislation Prussia and other states took long steps in the same direction. (See STEIN.) This was the one great direct result of the revolutionary propaganda. For political liberty and popular government in Europe, Napoleon of his own will did nothing; nor was it his purpose to contribute in any way to the establishment of national states in central Europe. These things were not compatible with his European empire. The seeds of democracy, however, had been sown in the early years of the Revolution; and national feeling was fostered among the peoples of Europe by the struggle against foreign rule which Napoleon forced upon them. Knowing that the dynastic method of warfare would be unavailable to make head against him, the monarchs were forced to make common cause with their subjects. The constitution of 1812 in Spain, the organization of local self-government and of a popular army in Prussia, were results of French aggression; and it was the national forces of Spain that prepared Napoleon's downfall, as it was the national levies of Prussia that helped to consummate it. By establishing legal equality and by awakening the desire for national self-government the Revolution gave a unity to subsequent developments in Europe, which had not been seen since the Reformation broke up the uniformity of the mediæval civilization. Yet Europe, after the fall of Napoleon, entered on a period of sharp recoil from the ideals of the Revolution. At the Congress of Vienna (1814-15) the Powers, under the leadership of Austria, made a deliberate attempt to return to the conditions that had prevailed before 1789. The map of Europe, with which Napoleon had played havoc, was reconstructed in the interest of "legitimacy" and "convenance" and of the balance of power, that great ideal of eighteenth-century statecraft. France was restricted to her ancient boundaries. Belgium and Holland were united into a kingdom to keep watch on the northern boundary of France. Norway was taken from Denmark and given to Sweden to make up for the annexation of Finland by Russia. Russia received also the Grand Duchy of Warsaw, which was organized as a separate kingdom of Poland. For the unity of Germany and of Italy nothing was done. Prussia and Austria were both strengthened. Prussia gained territory chiefly in north and west Germany, Austria in Italy. The smaller German states and free cities, greatly reduced in number, were united with Prussia and Austria in a German confederacy, in which Austria held the presidency. In Italy Sardinia was strengthened; but Austria held a dominant position in the north. The Papal States were reëstablished, and Naples and Sicily were restored to their Bourbon ruler. (See Map: EUROPE AFTER THE CONGRESS OF VIENNA.)

Reaction and Revolution (1815-52). The purpose of the Congress of Vienna was to reëstablish legitimate monarchic authority. To maintain this authority and to resist all revolutionary movements, an alliance was formed by the emperors of Russia and Austria and the King of Prussia. (See HOLY ALLIANCE.) Of this


EUROPE
at the Time of
the Greatest Expansion of
NAPOLEON'S POWER, 1812.
SCALE OF MILES.
KILOMETERS.
Longitude East from Greenwich
IRELAND
ENGLAND
Wales
London
North Sea
Hague
Amsterdam
Holland
Hamburg
Westphalia
DENMARK
Copenhagen
SWEDEN
Bornholm
Rügen
Swedish Pomerania
Lübeck
Mecklenburg
Berlin
PRUSSIA
Prussia
Danzig
Königsberg
Friedland
RUSSIA
DUCHY OF WARSAW
Posen
Warsaw
Saxony
Leipzig
Jena
Dresden
Bautzen
Breslau
Silesia
Cracow
Galicia
Brussels
Waterloo
Boulogne
Aix-la-Chapelle
Cologne
Coblentz
Erfurt
CONFEDERATION OF THE RHINE
Treves
Mayence
Prague
Bohemia
Austerlitz
Rouen
Seine
Valmy
Paris
Fontainebleau
Metz
Strasburg
Ulm
Munich
Bavaria
Württemberg
Hohenlinden
Austria
Wagram
Vienna
Danube
AUSTRIAN EMPIRE
Pest
Hungary
FRENCH EMPIRE
Loire
Nantes
Vendée
Besançon
Neuchatel
HELVETIC REPUBLIC
Bern
Geneva
Simplon
Tyrol
Drave
Theiss
Slavonia
Lyon
Chambery
Turin
Milan
Marengo
Arcola
Venice
KINGDOM OF ITALY
ILLYRIAN PROVINCES
Bosnia
Servia
OTTOMAN EMPIRE
Montenegro
Bordeaux
Garonne
Rivoli
Rhone
Genoa
Lucca
Florence
Orthez
Toulouse
Marseille
Toulon
S. Sebastian
Vittoria
ANDORRA
Saragossa
Ebro
SPAIN
Atlantic Ocean
Corsica
Piombino
Mediterranean Sea
Adriatic Sea
Rome
KINGDOM OF NAPLES
Naples
KINGDOM OF SARDINIA


EUROPE
after the Congress at Vienna
1815.
Boundary of German Confederation, thus:
Prussia, in 1815, thus:
Other German Ter. thus:
SCALE OF MILES.
KILOMETERS.
Longitude East from Greenwich
IRELAND
ENGLAND
Wales
London
North Sea
Amsterdam
Hague
DENMARK
Copenhagen
SWEDEN
Bornholm
Duppel
Schleswig
Holstein
Lübeck
Mecklenburg
Hamburg
Oldenburg
Bremen
Elbe
HANOVER
Hanover
Pomerania
PRUSSIA
Berlin
Posen
Magdeburg
Brandenburg
Vistula
Warsaw
RUSSIA
Poland
Oder
NETHERLANDS
Munster
Wesel
Anhalt
Leipzig
Silesia
Breslau
Kingdom of Saxony
Dresden
Saxon Duchies
Boulogne
Lille
Köln (Cologne)
Coblentz
Frankfurt
Sadowa
Königgrätz
Galicia
Amiens
St. Quentin
Rouen
Seine
Mainz (Mayence)
Rhine
Prague
Bohemia
Moravia
Versailles
St. Cloud
Paris
Mars-la-Tour
Metz
Wörth
Strasburg
Stuttgart
Regensburg
Danube
Vienna
Pressburg
Pest
Orléans
Chaumont
Belfort
Munich
Austria
Württemberg
Baden
Bavaria
AUSTRIAN EMPIRE
Hungary
Loire
Nantes
Dijon
Besançon
Neuchatel
Bern
SWITZERLAND
Innsbruck
Salzburg
Styria
Tyrol
Carinthia
FRANCE
Geneva
Savoy
Venice
Carniola
Croatia
Slavonia
Save
Drave
Theiss
Banat
Lombardy
Milan
Magenta
Solferino
Mantua
Venice
Turin
Piedmont
Genoa
Parma
Modena
Bologna
Ravenna
San Marino
Bosnia
Servia
Dalmatia
TURKISH EMPIRE
Montenegro
Bordeaux
Garonne
Toulouse
Rhone
Monaco
Nice
Marseille
Leghorn
Lucca
Grand Duchy of Tuscany
PAPAL STATES
Adriatic Sea
SPAIN
ANDORRA
Ebro
Atlantic Ocean
Corsica
Mediterranean Sea
Rome
TWO SICILIES
Gaeta
Naples
KINGDOM OF SARDINIA
M.-N. WORKS

alliance and of the reactionary policy followed by the majority of the European governments till 1848, Metternich (q.v.), the Austrian Minister, was the directing spirit. Among the peoples of Europe, however, there was a natural desire for some share in government; and in Germany and Italy there was a strong desire for national unity. The attitude of the princes made it appear impossible that unity could be attained except through popular sovereignty. For this reason the nationalists in Germany and Italy became revolutionists and to a large extent republicans. Revolutionary agitation was maintained by secret associations. (See BURSCHENSCHAFT; MAZZINI; YOUNG ITALY.) The first popular outbreaks occurred in 1820 in Spain and in Naples. In each of these kingdoms the monarch was forced to grant a liberal constitution. Acting under the authorization of European congresses, Austria forcibly intervened in Naples and France in Spain; the objectionable constitutions were withdrawn, and absolute royal government was reëstablished. In 1821 Greece revolted from Turkey and with the aid of England, France, and Russia, achieved her independence. The next purely political outbreak occurred in 1830 in France. Louis XVIII had granted his people a constitution and had reigned in peace. Charles X attempted to subvert the constitution and was deposed. (See JULY REVOLUTION.) Louis Philippe, of the house of Orléans, was made King, and a more liberal constitution was adopted. The French example stirred the Liberals to action in other parts of Europe. In Germany a few of the smaller kingdoms and principalities had already received representative constitutions; in 1830, in consequence of popular demonstrations, nearly all the other minor states were constitutionalized. The governments of Prussia and of Austria, however, made no such concessions. In Belgium and in Poland insurrections occurred, which were national rather than political. The Belgians revolted against the Dutch rule and elected Leopold of Saxe-Coburg as their King; and France and England forced Holland to recognize Belgian independence (1831). Poland rebelled against its King, the Russian Czar; but this rebellion was crushed, and Poland became a Russian province. In 1848 France was again in revolution. (See FEBRUARY REVOLUTION.) Louis Philippe had resisted the demand for a wider suffrage and was deposed. A republic was established; a struggle followed between the socialistic and conservative elements; a socialistic rising in Paris was put down with much slaughter; Louis Napoleon was elected President. Three years later the President overthrew the constitution, and in 1852 he assumed the title of Emperor. (See NAPOLEON III.) Both of these changes were approved by vote of the French people. In 1848, as in 1830, the disturbances at Paris were followed by disturbances throughout central Europe. Popular uprisings at Berlin and Vienna forced the Prussian and Austrian rulers to grant constitutions. Here and everywhere else in Germany the revolutionary leaders also demanded national unity. All the German kings and princes bowed to the storm, and a parliament was assembled at Frankfort to draw up a constitution for a united Germany. Simultaneously the people of Schleswig-Holstein took arms against Denmark and demanded that these duchies should be incorporated in the new Germany; while the Bohemian, Hungarian, and Italian subjects of Austria rose against German rule. The Austrians were driven out of Lombardy and Venice, and throughout the rest of Italy the people either expelled their princes or forced them to send troops to the aid of the insurgent Venetians and Lombards. The united Italian forces were placed under the command of the King of Sardinia. All these movements came to nothing. The Austrian army restored order in Bohemia and at Vienna, and defeated the Italians. With the aid of Russia, the Hungarian insurrection also was crushed. All the Italian princes recovered their thrones; the Pope, who had been expelled from Rome, was reinstated by Napoleon. The Frankfort Parliament, after long deliberation, determined to organize all Germany except Austria as a federal empire, and offered the King of Prussia the Imperial crown. He declined the offer, and the German Parliament dispersed. A belated attempt of the King of Prussia to organize the "narrower Germany" on more conservative lines than those proposed at Frankfort also failed. The old confederation was reëstablished, and the people of Schleswig-Holstein were again made subject to the King of Denmark. Thus, after many revolutions, we find the conservative *status quo* of 1815 still existing.

Eastern Affairs (1815–56). In 1821 a rising against the Turks in Wallachia gave the signal for insurrection in Greece. After several years of conflict Russia, England, and France intervened. The Allies destroyed the Turkish-Egyptian fleet at Navarino (1827), and Russia declared war on Turkey (1828). The Peace of Adrianople (1829) guaranteed to Servia, Wallachia, and Moldavia the management of their own affairs under Christian governors and made Greece independent. Greece was organized as a kingdom under Otto of Bavaria (1832–62). In 1831 war broke out between the viceroy of Egypt, Mehemet Ali, and his suzerain, the Sultan, and the Turkish forces were worsted. Russia intervened and brought about peace, taking pay for its services in a treaty of alliance (Unkiar-Skelessi, 1833) which practically gave it a protectorate over the Turkish Empire. In 1853, after attempting to arrange with England a partition of the Turkish Empire, Russia occupied the Danubian principalities. Austria and Prussia assumed an attitude of unfriendly neutrality; England and France came to the aid of Turkey, and carried the war into Russian territory. (See CRIMEAN WAR.) The Peace of Paris, 1856, pushed Russia back from the mouth of the Danube (Bessarabia, previously Russian, being ceded to Moldavia), neutralized the Black Sea, and placed Turkey under the protection of Europe. In return Turkey promised reforms.

National Organization of Italy and of Germany (1859–71). The unification of Italy and of Germany, which the popular revolutions of 1848 had failed to achieve, was accomplished by revolution from above. In Italy the movement was initiated and directed by the Sardinian premier, Cavour (q.v.); in Germany it was carried through by the Prussian premier, Bismarck (q.v.). Austria was the great obstacle to both movements, and it took two great wars to expel the Austrians from Italy and from Germany. It was not in the interest either of Russia or of France that strong states should be established in central Europe; but Russia remained neutral, because, remembering the aid given to Austria in 1849, the Czar bitterly resented the "ungrateful" attitude assumed by Austria during the Crimean War; and Napoleon III (q.v.) assisted Sardinia and encouraged Prussia, partly in expectation of petty advantages, partly by reason of an unpractical zeal for the "principle of nationality." In 1859 France and Sardinia defeated Austria, and Sardinia obtained Lombardy. France was later paid for her services by the cession of Savoy and Nice. Simultaneously all the small states of north Italy and the northern provinces of the states of the church established revolutionary governments and demanded union with Sardinia. In 1860 Garibaldi (q.v.) overthrew the Kingdom of the Two Sicilies and placed all Italy south of Rome in the hands of the King of Sardinia. In 1861 the Kingdom of Italy was established, including all the peninsula except Venice held by Austria, and Rome held by the Pope with the assistance of France. During these movements Prussia stood inactive. In 1863 Denmark, in violation of its treaty engagements, endeavored to incorporate Schleswig. Prussia, of which Bismarck was now Premier, acting in concert with Austria, made war on Denmark, and the Allies obtained joint sovereignty over Schleswig-Holstein (q.v.). In 1866, in alliance with Italy, Prussia made war on Austria. Austria was supported by all the south German states and by the more important states of north Germany, but victory rested with Prussia. (See SEVEN WEEKS' WAR.) Italy obtained Venice as a reward for her alliance with Germany; Prussia annexed a considerable part of north Germany, and organized with the remaining principalities and cities a north German federal state, of which the King of Prussia was hereditary President. Failing to obtain any compensation for his benevolent neutrality, Napoleon III was forced by French popular feeling to quarrel with Prussia and to endeavor to arrest the unification of Germany. In the ensuing war (1870–71) the south German states acted with Prussia; and during the German siege of Paris King William of Prussia was proclaimed Emperor of a united Germany. To this new Empire France was forced to cede Alsace and a part of Lorraine. (See FRANCO-GERMAN WAR.) During the war Italy annexed Rome (1870).

The Roman Catholic Church and the Modern States. Just before the occupation of Rome by the Italians, an Ecumenical Council (1869–70) had defined the dogma of papal infallibility. Viewed politically, this dogma signifies the complete subjection of the bishops to papal authority and the centralized guidance of the church militant in its struggle against what it regards as the usurpations of the modern states. Simultaneously Catholic or "Ultramontane" parties were organized (or reorganized) in many of the European states; and while these parties deny the right of the church to direct their political activity, they are supported by church influence and work in accordance with the general policy of the church. In Prussia and other states these movements have led to legislation intended to check the political activity of the clergy and to diminish the control of the church over education. (See KULTURKAMPF.) The furthest step was taken by the French Republic in 1902 in the effort to resist and supervise education by the clergy.

The Eastern Question (1856–1914). The Eastern Question had been the outstanding problem of Europe almost from the time when the Turks entered Constantinople in 1453. Although individual nations had been interested in the Balkans for special reasons, the question was primarily European, owing to the general fear that the dominance of one power in Turkey, particularly Russia, would disturb the balance of power and so upset international relations. For this reason every important state in Europe, no matter how remote its interests in the Balkan Peninsula, has been deeply concerned in the fate of Turkey.

The Peace of Paris, which closed the Crimean War, although it settled little or nothing, marks the first attempt of Europe as a whole to solve the Eastern Question. Turkey came out of the struggle not only unscathed but "respectable"; she was formally admitted into the family of nations; her independence was recognized, and her territory guaranteed. This treaty was signed by representatives of Russia, England, France, Prussia, Turkey, and Sardinia. The assistance given by the Christian Powers to the Turk made him feel safe in oppressing his Christian subjects, because they looked to defeated Russia for help; and it became a policy of the Porte to play off one Christian power against another in order to continue its tyranny undisturbed. The history of Turkey during the nineteenth and twentieth centuries is a dreadful story of massacres, riots, uprisings, and assassinations. Europe looked on, uneasy and conscience-stricken, but loath to interfere unless its interests were threatened. The frightful Bulgarian atrocities of 1876 brought denunciation from England, but war from Russia, which made itself the champion of the Greek Orthodox Slavs in the Turkish Empire. Once more Russian armies marched into Turkey (see RUSSO-TURKISH WAR) and compelled the Ottoman government to sign the humiliating Treaty of San Stefano (1878). The Mohammedans were to be turned out "bag and baggage," when England, fearing increased Russian prestige, declared that the question could be settled only by a concert of the Powers. A great congress was then called at Berlin in 1878 (see BERLIN, CONGRESS OF), which undertook the dismemberment of European Turkey. The independence of Montenegro, Servia, and Rumania was recognized; a new state, Bulgaria, was called into existence, and Austria was to "administer" the provinces of Bosnia and Herzegovina. The results of the Congress of Berlin were very important: 11,000,000 Christians were freed from Turkish misrule; Russia, thrice frustrated in her attempt to get Constantinople, turned her attention to the Far East; Austria entered as a vital factor in the situation; and, finally, a new group of Balkan nations made their appearance, and these soon became ambitious to settle the Eastern Question in their own interests.

One thing remained unchanged—the tyranny of the Turkish government, which, under Sultan Abd-ul-Hamid II, became more intolerable than ever. Suddenly, in July, 1908, the impossible happened: a revolution against the Sultan by the Turks themselves. A progressive element among the Mohammedans, known as the Young Turks, organized a powerful society known as the Committee of Union and Progress, which got control of the army and deposed Abd-ul-Hamid. A constitutional government was then established. Mohammed V, brother of the deposed Sultan, was chosen as his successor, and a popularly elected parliament was organized. The

Young Turks were dominated by the European ideals of democracy and nationality. They wished to modernize the Turkish government and society, reform Mohammedanism, and particularly to weld the various races into a true Turkish nation. They failed miserably, either because the task was too great for them or because they came too late on the scene. The Mohammedans became angry at the equal treatment given to the Christians by the new régime; the latter began plotting to join their kinsmen in the Balkan States; the army was unpaid and discontented; revolts among the semisavage tribesmen became frequent; and the leaders among the Young Turks were inexperienced and incapable of handling a new situation. Worst of all, came financial embarrassment. It soon became evident that there could be no solution of the Eastern Question without a dissolution of the Turkish Empire.

On Oct. 7, 1908, there took place the great diplomatic *coup* of Baron von Aehrenthal, the Austrian Foreign Minister, who announced the formal annexation of Bosnia and Herzegovina to Austria, thus breaking the Treaty of Berlin. There was great resentment against this action all over Europe, particularly in Servia. Six years later (July, 1914) Archduke Francis Ferdinand, the heir to the Austrian crown, was assassinated in Bosnia by a patriotic Servian. See WAR IN EUROPE.

Italy, which had marked out northern Africa as its field of colonial expansion, suddenly declared war (Sept. 29, 1911) against Turkey and seized Tripoli. (See ITALY, *History*.) In the fall of 1912 the Balkan States, taking advantage of the embarrassment of Turkey, entered into an alliance and declared war against their old enemy. (See BALKAN WAR.) In the campaigns that followed, the Turkish armies were completely defeated by the allies, who were marching victoriously to Constantinople. The Turk was about to be driven out of Europe at last when the allies began to quarrel amongst themselves. As a result, Constantinople and Adrianople with their adjacent territories remained under the Ottoman flag, but nearly all the rest of European Turkey was divided among the Balkan States. Albania was created into an independent state, with Prince William of Wied as its ruler. The enlarged Balkan nations became a source of uneasiness to Europe in general and to Austria in particular. There was fear of the possible appearance of a federal Slav state which would disturb the balance of power and create rebellion among the Austrian Slavs.

European Alliances. The emergence of Germany as one of the most important of the European Powers necessitated a readjustment of international relations. It was Bismarck's constant policy to be on good terms with Russia so as to prevent her from falling into the arms of France. With this idea in view, he organized in 1872 the Dreikaiserbund, or Three Emperors League, composed of Germany, Austria, and Russia. For reasons best known to the secret history of diplomacy, Germany and Russia became estranged, and the league became a dead letter. This was France's opportunity, and she immediately began making overtures to Russia for an offensive and defensive alliance.

In the mean while the Italians were greatly angered by the French occupation of Tunis—"the last door open to Italian expansion," as it was then thought. Moreover, there was great fear that the French clericals were plotting to restore the Pope to his temporal power. For these reasons Italy joined Germany and Austria in forming the famous Triple Alliance organized by Bismarck in 1882. What the terms of this treaty are have never been revealed; it is surmised, however, that the Triple Alliance would aid Germany in case of an attack by France, would promote Austrian interests in the Balkans, and encourage Italy in her policy of colonial expansion. Although the treaty has been renewed several times, rumor has it that its effectiveness is gone. Since the annexation of Tripoli, Italy, never very happy under the burden of militarism required of her by the alliance, has shown a lack of interest in the treaty. For this reason Germany and Austria have drawn more closely together.

The Franco-Russian *entente* became a hard and fast Dual Alliance when, in 1897, at an official banquet, Czar Nicholas II toasted President Félix Faure of France as "my friend and ally." Like the Triple Alliance, the Dual one is mainly defensive. Russia is to help France in case of an attack by Germany and in return French loans are to be forthcoming to the Russian government.

Diplomacy, no less than politics, makes strange bedfellows. The common fear of Germany has drawn together the century-old enemies, England and France, into a semialliance known as the *entente cordiale*. In a war with Germany the English fleet would be of great value to France and the French army to England. The effectiveness of this understanding was tested in the Morocco affair (see MOROCCO, *History*), as the loyal support given by England to France's determination to annex Morocco in 1911 was mainly responsible for the diplomatic rout of Germany on that occasion. Russia's alliance with France has made the *entente cordiale* into a *Triple Entente*, with the result that Germany's position in Europe has become rather precarious. The international crisis of 1911 was directly responsible for the increase of armaments among the nations of Europe. Germany added in 1913 about 40,000 men to her already enormous standing army; and France, not to be outdone, passed the three years' military service law (see FRANCE, *History*), because her stationary population made it impossible to increase her army without increasing the term of service.

Europe in the Twentieth Century. The population of Europe in 1914 was about 425,000,000, an average yearly increase in the previous decade of over 3,000,000 in spite of the large emigration. There is no distinct and definite European race, for all the peoples are of mixed origin. But taking language as a test and grouping cognate languages, about 31 per cent of the inhabitants are Slavs, living mainly in the eastern part; about 27 per cent are Latins, living in the southern and western parts; and about 32 per cent are Teutons—Germans, English, Scandinavians, Dutch, and Flemings—living mainly in the north. There are also the so-called non-European races, like the Finns, Hungarians, Turks, and Jews, who make up the remaining 10 per cent. About 95 per cent of the population are Christians, divided roughly into 45 per cent Catholic, 26 per cent Orthodox, and 26 per cent Protestant. Politically Europe consists of 26 independent states:

four empires, viz., Russia, Germany, Austria-Hungary, and Turkey; 13 kingdoms—Great Britain, Spain, Italy, Belgium, Greece, Holland, Sweden, Norway, Denmark, Bulgaria, Servia, Montenegro, and Rumania; 4 principalities—Albania, Monaco, Lichtenstein, and the Grand Duchy of Luxemburg; and 5 republics—France, Switzerland, Portugal, Andorra, and San Marino. Two are federal states, Germany and Switzerland; one dual, Austria-Hungary; and the rest are unitary. In none does absolute monarchy as a form of government exist, although in Russia constitutionalism is of a very weak variety. The system of parliamentary government based upon the English model has been adopted in one form or another in every European state. Industrially England, Germany, France, and Belgium are most advanced; eastern and southern Europe are still largely agricultural, although the industrial revolution is making rapid headway in these places.

The twentieth century is witnessing the rapid spread of European civilization to the old nations of Asia and to the savage races of Africa. The coming of the missionaries preaching what has become a European religion, Christianity, and the desire of the manufacturers and capitalists to develop the resources of the backward countries of the world, has profoundly affected the life of non-European peoples. Factories, railways, telephones, printing presses, and steamboats are almost as common in China, India, and northern Africa as they are in Europe and in America. The world is rapidly acquiring a common civilization, which has not only been created but spread by Europeans.

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EUROPE, Peoples of. All Europeans belong to the White, or Caucasian, and the Yellow, or Mongoloid, varieties of man. Throughout historic time Europe has been a meeting ground of races, differing from each other in complexion, stature, physical features, temperament, language, occupation, social organization, government, opinion, and religion. In studying the ethnology of this portion of the Eastern Hemisphere it is imperative to hold these several categories apart in the mind, especially those of race or blood kinship, the result of crossbreeding; speech or linguistic affinities, the result of acculturation; arts, the result of commerce or contact;. and social life or nationality, the result of conquest. It is true that these concepts are related, and each is of value in the whole account of any people. When, however, one attempts to argue that people who speak the same language or practice the same arts are necessarily akin, confusion is certain to arise.

Beginning with the first account of ancient man in Europe, paleëthnology may be divided into three parts: (1) Tertiary man, or the origin of humanity; (2) Quaternary man, or the development of humanity; (3) present types of man. It is to be distinctly understood that this classification is intended only as a guide to study. New discoveries are constantly demanding new adjustments with reference to the earliest races of men in Europe.

The existence of Tertiary man is yet in doubt, for our sole information concerning him rests upon the finding of extremely rude stone implements (called eoliths) in geological layers which are thought to be Tertiary. These supposed primitive implements, so far as their shape is concerned, might be only the refuse of later manufactures of more delicate objects. For in America, where at first materials of this character were regarded as showing the existence of man on this continent many thousands of years ago, they are now known to be the quarry refuse of historic tribes. In Europe the argument against the eoliths rests on the suspicion that the supposed indications of use by human hands are merely the product of natural causes. Thus, the demand is made that eoliths, in order to be recognized as genuine, should be made of material foreign to the deposit in which they are found. Nevertheless, Obermaier, who takes a very skeptical attitude towards both Tertiary man and the eolithic problem, admits the possibility of both and accepts as reasonable the view that the earliest paleolithic tools must have developed from simpler forms, however difficult it may be to differentiate these from unworked stones.

Still keeping in mind geological epochs, European archæologists divide human culture into Prehistoric, Protohistoric, and Historic. Again, it is thought possible to separate the life of man in Europe into ages according to the materials which characterize the several periods, as the Stone age, Bronze age, and Iron age. It must be remembered at this point, however, that the word "age" does not refer to definite chronological dates, but that in the progress of human development man lived first in the stone grade, next in the bronze grade, and lastly in the iron grade of culture.

Leaving out of view, then, the question as to the existence of man in the Tertiary period, substantial exploration begins with the Quaternary epoch. In his investigations there the inquirer is everywhere confronted by problems concerning cosmic changes in climate, the plants and animals which were contemporaneous with man during these changes, the species or varieties of man based on the human crania actually discovered, as well as on the progress in arts, especially those in stone. Notwithstanding the speculative character of much that is affirmed about Quaternary man in Europe, an examination of the accumulated evidences leaves the impression of a long perspective of history, in which the life of the species was gradually transformed by human ingenuity into the higher culture, the life wherein nearly every conscious action is performed artificially. On the assumption that the forward movement of this artificial life is an unquestionable fact, the relics of human industry discovered in the caves and other archæological stations throughout all the countries of Europe may be mapped out in a series. Attempts have been made to mark epochs in this progress, and names have been given to them from locations where typical specimens of that particular grade of art were to be found, beginning with the Chellean, and ending with the Tourassian for the Paleolithic period.

EUROPEAN PALEËTHNOLOGY

Times		Ages	Periods	Epochs
Actual or Recent Quaternary	Historic	Of iron	Merovingian	Wabenian (Waben, Pas-de-Calais).
			Roman	Champdolian (Champdolent, Seine-et-Oise).
				Lugdunian (Lyon, Rhône).
	Protohistoric		Galatian	Beuvraysian (Mont Beuvray, Nièvre).
				Marnian (Department of the Marne).
				Hallstattian (Hallstatt, Austria).
		Of bronze	Tsiganian	Larnaudian (Larnaud, Jura).
				Morgian (Morges, Vaud, Switz.).
	Prehistoric	Of stone	Neolithic	Robenhausian (Robenhausen, Zürich).
				Asylian (Mas d'Azil, Ariège).
Ancient Quaternary			Paleolithic	Magdalenian (La Madeleine, Dordogne).
				Solutrean (Solutre, Saône-et-Loire).
				Aurignacian (Aurignac, Haute Garonne).
				Mousterian (Le Moustier, Dordogne).
				Acheulean (Saint-Acheul, Somme).
				Chellean (Chelles, Seine-et-Marne).
Tertiary			Eolithic	Puycournian (Puy-courny, Cantal).
				Thenaysian (Thenay, Loir-et-Cher).

A fair number of skeletal remains to which the title Quaternary has been applied can now be vouched for as beyond question.

All the finds may be grouped as belonging to one of two races—the Neanderthal race, which shows striking differences from modern man, and the Cro-Magnon race, which clearly exhibits affinity with him. The oldest of all the remains is the jaw unearthed in Mauer, near Heidelberg. It belongs either to the Old or the Middle Quaternary, and Obermaier's avowedly most conservative minimum estimate sets its age at 100,000 years. Clearly human in its teeth, this find resembles other Neanderthal remains in its chinless character and surpasses all in primitiveness by virtue of the extraordinary massiveness of the jaw. A remarkable find made in December, 1912, near Piltdown, Sussex, by Dawson, consisting of part of a skull, a lower jaw, and a canine tooth, has been the subject of vigorous discussion, especially by Drs. Keith and Smith Woodward, the latter assigning it to a distinct genus of humanity, which he dubs *Eoanthropus dawsoni*. The interest of the find, which some regard as contemporaneous with Chellean objects, lies in the incongruity of the distinctively human forehead with the apelike jaw.

Among the best-known remains of the Neanderthal type may be mentioned a burial at Le Moustier belonging to the Late Acheulean or Old Mousterian epoch, the burials of La Ferrassie and La Chapelle-aux-Saints (Mousterian), the jaw of La Naulette, and the two Spy skeletons (all from Belgium and of the Mousterian epoch), the Neanderthal skull proper (of uncertain epoch, but almost certainly Old Paleolithic), and the Croatian skeletons from Krapina (Late Chellean). All these and other Neanderthaloid remains point to a thickset race of short stature (160 centimeters), with low, long, and narrow skullcap, receding forehead, very prominent brow ridges, and massive lower jaw without projection of the chin. The Neanderthal type was not by any means uniform, however. Thus, while the West European specimens of the race indicate dolichocephalic skulls (70 to 75.7), the Krapina fragments show a distinct tendency to brachycephaly.

The Cro-Magnon race certainly dates back to Aurignacian times, as proved by the skeletons of Mentone, Cro-Magnon and Laugerie Haute (Dordogne), and Combe-Capelle (Périgord). Important Magdalenian finds were made at Laugerie Basse, La Madeleine, and Chancelade (all in the Dordogne district). The tendency to variation was far more strongly pronounced among the Cro-Magnon people than among their Neanderthaloid predecessors and contemporaries. Thus, the skeletal remains in the Grimaldi grottoes point to a lofty stature of 187 centimeters (6 feet, 1½ inches), while that of the Combe-Capelle man does not seem to have exceeded 166 centimeters. In all Cro-Magnon specimens, however, the skullcap is high, the brow ridges are unobtrusive, the jaw is less massive, and there is a pronounced chin. There is marked dolichocephaly, the index being 65.7 for that from Combe-Capelle, but with a considerable range of variation (Cro-Magnon, 73.8). Some of the Grimaldi remains have been interpreted as belonging to a Negroid people, but this conclusion has not been definitely established. The precise relations of the Neanderthal and Cro-Magnon races are by no means clear. Among other hypotheses it has been suggested that the Cro-Magnon men did not develop from the Neanderthalers, but originated outside of Europe, immigrated, became in part blended with the native populations, and ultimately supplanted them.

After these Paleolithic epochs, during which man attained not only his present physical type, but also a very creditable degree of industrial and artistic culture, came the Neolithic or Polished Stone period, followed by the Bronze or Tsiganian period, and this by the age of Iron. These changes did not come by sudden breaking down of the Stone and Bronze ages, but by transitional steps with a separate history in each of the countries of Europe. For instance, the Polished Stone period was not developed simultaneously over the continent. Scandinavia, in its northern parts, was covered with glaciers, and only in the refuse piles in Denmark are polished-stone hatchets found contemporaneously

CLIMATIC AND OTHER CHANGES IN THE PALEOLITHIC EPOCHS

NO.	Climate	Geologic action	Plants	Animals
1 Azylian	As at present			Fauna of to-day, *Cervus elaphus* abundant. Reindeer disappears.
2 Magdalenian	Cold and dry	Formation of red earth with angular pebbles	Polar moss in Württemberg	Man, race of Laugerie Basse. Great development of northern fauna, reindeer, etc. Extinction of mammoth.
3 Solutrean	Mild and dry	Retreat of the glaciers		Horse abundant. Reindeer. Mammoth. Increase of rhinoceros.
4 Aurignacian	Cold	Gradual retreat of glaciers		Mammoth, Siberian rhinoceros, reindeer, cave bear, bison, horse. Man: Cro-Magnon race.
5 Mousterian	Cold and moist	Great extension of glaciers, and consequent changes of the soil and levels	Flora of cold regions	Arctic fauna. Mammoth, *Rhinoceros tichorinus*, cave bear, musk ox.
6 Acheulean	Mild and moist	Alluvium of the high levels. Loam of the plateaus	Flora in transition	Fauna intermediate. Appearance of mammoth. Disappearance of *Elephas antiquus*.
7 Chellean	Warm and humid	Subsidence. Filling of the valleys. Alluvium everywhere at lower levels	Flora subtropical. Mediterranean plants in Seine valley	Man. Neanderthal race. Tropical fauna. Hippopotamus. *Rhinoceros merckii*, *Elephas antiquus*. Extinction of Tertiary forms.

CLASSIFICATION OF QUATERNARY CULTURE IN EUROPE

PERIOD	Epoch	Technic	Characteristic implements
End of the Paleolithic	Azylian	Workmanship in bone and stone degenerated	Harpoon heads flat, with large barbs, in antler. Passage from the Paleolithic period into the Neolithic.
Upper Paleolithic	Magdalenian	Development of work on bone and hard substances	Burins or gravers in flint. Flint blades thin and symmetrical. Development of bone implements and of fine art.
	Solutrean	Flints worked by pressure	Laurel-leaf blades. The skin scraper appears. Apogee of stone implements.
	Aurignacian	Marginal retouching by striking and pressure	Blades of unilateral curvature; tools thinner than those of Mousterian epoch.
Middle Paleolithic	Mousterian	Flints that show retouching (chipped and flaked)	Stone blades to be held in the hand, knives and choppers. Blades wide and thick, and chipped on one face only. Disappearance of the flaked axe (*coup de poing*).
Transition Paleolithic	Acheulean	Mixed art	Leaf-shape blades, *langue de chat*, narrower, thinner, more delicate, and carefully finished.
Lower Paleolithic	Chellean	Made by direct blows	Only one stone implement, the *coup de poing*, large, coarse, with large facets on each side.

with Neolithic tools of the rest of Europe. There were even, until quite recently, tribes in Russia who were still in this grade of progress.

These ancient Neolithic peoples were sedentary and industrial. Their food was not obtained wholly by natural processes, but artificialism in the cultivation of the soil and the domestication of animals progressed. Their homes were no longer movable tents, but substantial buildings. They constructed the pile dwellings of Switzerland, France, Italy, and perhaps of Ireland. They buried their dead under dolmens, and it was they who set up huge megalithic monuments in England, Brittany, and Spain.

The Neolithic peoples of the British Isles, as well as of other parts of western Europe, were quite long-headed, the ratio of the length to the width of the skull being as low as 65–75. These earliest of European industrial peoples had also long faces like some existing populations of Europe. It must be carefully noted at this point that in Sweden, France, Switzerland, Germany, Austria, Spain, and Portugal crania of short-headed peoples are found mixed with dolichocephalic skulls. This tells an important story, for it clearly shows that with progress race mixture had begun to take place, the borrowing of blood being associated with the community of arts. Another fact worthy of notice is that the erection of huge stone and earth monuments, called barrows by ethnologists, indicates the consolidation of society, implying an increasing number of persons who could be brought together in the same enterprise, and the consequent raising of an artificial food supply so that these masses might coöperate for longer periods of time.

The so-called ages of Metal in Europe, i.e., of Copper, Bronze, and Iron, comprise the remaining epochs in the popular scheme of European archæology. In America the earliest implements in copper were cold-hammered and ground into shape, the material being treated technically precisely as if it were stone. It is not surprising, therefore, to find the same condition of things in Europe. The parallelism is almost perfect in every respect. Copper tools and weapons do not mark a separate epoch, meaning that the stone implements ceased to be used at once, nor must it be inferred that there was a Copper age as distinguished from a Bronze age, for copper tools and weapons are found associated with bronze relics. And here arises one of the most interesting inquiries of all, how far the exquisite products in bronze, found all over Europe, are results of indigenous development, and how far they indicate commerce or instruction from without. There is no doubt that both of these factors coöperated, the result of which was the art as it existed in each region.

It is a well-known law of progress that suggestion is one of the strongest incentives to the use of materials and processes. There existed in central and western Europe a Bronze age, which in some characteristics of its products resembles the Orient and in others is entirely original. The art of bronze smelting and working could not arise originally and develop completely and independently in any land; and secondly, such an art could not be imposed bodily upon a people who were not far enough advanced to add to it many thoughts and technical processes of their own. Progress and complexity in artificial activities are produced by the mutual influence of races and peoples. In proof of this the Bronze age witnessed the coming of a great variety of physical types. In England the people became more brachycephalic, the ratio of head length to head width being 81. In Sweden and Denmark long-headed people, tall and fair-haired, coexisted with those of much larger index. In the valley of the Rhine, as well as in southern Germany and Switzerland, the dolichocephaly was more pronounced. Knowledge of the use of fire among the peoples of the Bronze age was contemporaneous also with the cremation of the dead.

The earliest relics of the Iron age are found in the hamlet of Hallstatt, in Upper Austria, in thousands of graves, revealing implements of industry, weapons, and personal ornaments, but no pottery. At first it seemed to have had no affiliation with any other national art, but later researches put the earliest Iron age as a medium between the more advanced art of southern Europe and the West. Iron gradually replaced bronze, which had then passed into its æsthetic stage, and revealed the existence of Oriental influence in Europe. The long heads also became mingled with short heads, and in the La Tene, also called Marnean, epoch, skulls vary almost as much as at the present day. Von Luschan is of opinion that all the brachycephalic Europeans (Alpine race) are genetically related with the Hittites of western Asia, and holds that there were successive immigrations of short-headed peoples, the most recent and historically best-established one being that of the Magyars. On the other hand, Schliz inclines to the theory of a European origin of the brachycephalous skulls found in Europe.

The types of races mentioned extend far beyond the boundaries of Europe into Asia and Africa. The lines between the continents are entirely artificial.

Ripley finds three separate biological races of men in Europe:

1. TEUTONIC RACE. Dolicholeptorhine of Kollmann; Reihengräber of German writers; Germanic of English; Kymric of French; Nordic of Deniker; and *Homo europæus* of Lapouge.
2. ALPINE RACE (or Celtic). Celto-Slavic of French writers; Sarmatian of Von Hölder; Disentis of German writers; Arvernian of Beddoe; Occidental of Deniker; *Homo Alpinus* of Lapouge; and Lappanoid of Pruner-Bey.
3. MEDITERRANEAN RACE. Iberian of English writers; Ligurian of Italian writers; Ibero-Insular and Atlanto-Mediterranean of Deniker.

RACE	HEAD	FACE	HAIR	EYES	STATURE	NOSE
1 Teutonic	Long	Long	Very light	Blue	Tall	Narrow, aquiline
2 Alpine (Celtic)	Round	Broad	Light chestnut	Hasel-gray	Medium, stocky	Variable broad, heavy
3 Mediterranean	Long	Long	Dark brown or black	Dark	Medium, slender	Rather broad

Inquiry into the causes of difference in stature, head form, and color, leads to the profoundest of biological studies. To say that inheritance and variation are sufficient to account for them is to explain nothing. Even stature is not always a matter of nutrition. Much controversy has arisen over the origin of blondness in northern Europe. No doubt, albinism is more pronounced in Europe. Its marked appearance elsewhere is among the kindred peoples in northern Africa and southeastern Asia. The popular notion that exposure to the action of the sun's rays is the cause of brunetteness is altogether erroneous. No single known cause produces either albinism or brunetteness. It is quite probable that long ago the subspecies to which Europeans belong were yellow or Mongoloid in color, and that by the coöperation of environment and obscure physiological processes these characteristics became fixed and persistent through heredity.

Having fixed these three biological types in mind, the difficulty is in finding their representatives in modern Europe. Race is a matter of blood kinship, requiring isolation under favorable conditions for bringing about new character-

THE WHITE RACES OF EUROPE

HELLENIC FAMILY — A GREEK

SLAVIC FAMILY — A RUSSIAN

TEUTONIC FAMILY — A GERMAN

HEBREW FAMILY

CELTIC FAMILY — AN IRISHMAN

LATIN FAMILY — AN ITALIAN

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istics that become distinguishing and hereditary. These combined marks define race, and are not to be confounded with the term "people."

A people is a collection of human beings living together under a definite nationality and occupying a specific region. It is an elastic term, applying, it may be, to a small community, as the people of a certain valley or plain, but can also include all who are under the sway of a great nationality. In Europe there are the people of France, Belgium, Scandinavia, and Germany; of Italy, Spain, and Portugal; of Switzerland, Tirol, and the Netherlands; of the British Isles, Russia, Turkey, and Greece; and each one of these peoples becomes a problem to be solved with reference to race. No people are of one race, no race is confined to a single people. The entire population of Europe is 425,000,000, and besides the three races already mentioned, which include nearly all of this number, there are a few straggling peoples belonging to other races, such as the Basques, Lapps, Magyars, Semites, and Gypsies.

In the classification just described the races are only ideal types; but one of the latest authors on this subject, Deniker, publishes a scheme of the races of men more after the manner of the naturalists. Passing by the assumption that there may have been formerly a certain small number of typical races out of which all the peoples of Europe have grown, he takes the total population as he would a number of animals, and divides them up on biological characteristics as he finds them, without inquiring into their causes. The nations and peoples now existing in Europe have arisen from mixture in varying proportions of ancient varieties of our species. By abstracting from these millions of individuals certain ones having groups of definite characteristics relating to stature, the form of the head, pigmentation, and other somatic data, Deniker determines the status of each race, giving rise to six principal and four secondary races, leaving out Lapps, Ugrians, Mongolians, and others belonging to Asia.

DENIKER'S SCHEME OF EUROPEAN PEOPLES

I. Wavy brown or black hair, dark eyes

1. *Littoral European race*—tall stature; elongated, oval face; straight fine nose; mesocephalic.	Tawny white skin, black hair.
2. *Ibero-Insular race*—short stature, dolichocephalic.	
3. *Western European race*—short stature, round face, strongly brachycephalic.	Dull white skin, brown hair.
4. *Adriatic race*—tall stature, elongated face, brachycephalic.	

II. Fair, wavy, or straight hair, light eyes

5. *Northern European race*—somewhat wavy hair and reddish; tall stature; dolichocephalic.	Reddish white skin.
6. *Eastern European race*—somewhat straight flaxen hair; short stature; subbrachycephalic.	

Sergi pushes the study of classifying Europeans still further into the domain of natural history. In his work on the Mediterranean race he emphasizes the obligations which modern Europe owes to ancient peoples, like the Hamites of Egypt and northern Africa, the Semites of southwestern Asia, the early Greeks, Italians, and Iberians, for the foundation of their culture.

Laying aside the biological divisions of European peoples or countries, the concept of speech may be invoked to show what languages they use. At the outset it is affirmed that no people belong to one language, no language is confined to one people. The following general scheme shows the relationship between nationality and languages in Europe:

INDO-GERMANIC

1. *Celtic group.*
   - *a.* Gaelic. Irish, Highland Scotch, and Manx.
   - *b.* Cymric. Welsh, Low Breton, and Cornish (extinct).
2. *Romance group.*
   - *a.* French, in 18 dialects. The Langue d'Oc and Langue d'Oil are its two Romanic forms.
   - *b.* Italian, 14 principal dialects.
   - *c.* Spanish.
   - *d.* Provençal, 8 dialects.
   - *e.* Rumanic.
   - *f.* Portuguese.
   - *g.* Rumansch or Churwaelsh.
3. *Germanic group. Scandinavian branch.*
   - *a.* Swedish.
   - *b.* Danish or Danske.
   - *c.* Icelandic.
4. *Germanic group. Germanic branch.*
   - *a.* High German.
   - *b.* English.
   - *c.* Platt-Deutsch.
   - *d.* Dutch, with Flemish dialect.
   - *e.* Frisian.
5. *Slavic group. Eastern branch.*
   - *a.* Russian, with Ruthenian or Little Russian dialect.
   - *b.* Bulgarian.
   - *c.* Servian, with Sloventsi or Wend dialect and Croat dialect.
6. *Slavic group. Western branch.*
   - *a.* Polish.
   - *b.* Czech or Bohemian.
   - *c.* Wend, of Brandenburg and Silesia.
7. *Lettic group.*
   - *a.* Letts.
   - *b.* Lithuanian, with Shamaite and Prussian Lithuanian dialects.
8. *Hellenic group.*
   - *a.* Greek.
9. *Illyrian group.*
   - *a.* Albanian.
10. *Indic group.*
    - *a.* Gypsy, or Romany, in several dialects.

The dead languages of the family in Europe are: Etruscan (doubtful), Oscan, Umbrian, Latin, and Langue d' Oc and Langue d'Oil, of the Romance group; Gothic, Anglo-Saxon, Old Saxon, Old Dutch, Old Frisian, and Old Norse, in the Germanic group; Church Slavic, Old Bohemian, and Polabish, in the Slavic group; Old Prussian in the Lettic group; ancient Greek with its dialects.

TURANIAN OR FINNO-TATAR FAMILY

1. *Finnic group. Tchudic branch.*
   - *a.* Finnic or Suomic, two dialects.
   - *b.* Esthonian.
   - *c.* Tchoud.
   - *d.* Lapp.
   - *e.* Voth.
   - *f.* Livonian.
2. *Finnic group. Permian branch.*
   - *a.* Votiak.
   - *b.* Sirian or Siryanian.
   - *c.* Permiak, with Bissermian.
3. *Finnic group. Volgaic branch.*
   - *a.* Tchuvash.
   - *b.* Mordvin.
   - *c.* Cheremiss.
4. *Finnic group. Ugric branch.*
   - *a.* Magyar or Hungarian, with Szekler dialect.
   - *b.* Samoyed.
5. *Tataric group.*
   - *a.* Turkish or Osmanli.

CAUCASIAN FAMILY

1. *Leghian.*
2. *Circassian*, in 72 dialects.

BASQUE FAMILY

1. *Basque or Euskara* (with Spanish group and French group).

SEMITIC FAMILY

1. *Hebrew.*

Bibliography. Sources of information on the ethnology of Europe are abundant. Ripley compiled, as a supplement to his *Races of Europe,* a bibliography of 2000 titles arranged by authors and by topics. The official publications of anthropological societies pay great attention to literature on all branches of this subject. The principal serials are the *American Anthropologist* (Washington); *Annales de Démographie* (Paris); *Anthropologie* (ib.); *Archiv für Anthropologie* (Brunswick); *Archivio per l'Antropologia* (Florence); *Beiträge zur Anthropologie und Urgeschichte Bayerns* (Munich); *Bulletins de la Société d'Anthropologie de Paris* (Paris); *Centralblatt für Anthropologie, Ethnologie und Urgeschichte* (Munich); *Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* (Brunswick); *Journal of the Anthropological Institute of Great Britain and Ireland* (London); *Mémoires de la Société d'Anthropologie de Paris* (Paris); *Memoirs Read before the Anthropological Society of London* (London); *Mittheilungen der anthropologischen Gesellschaft in Wien* (Vienna); *Petermanns Mittheilungen aus Justus Perthes geographischer Anstalt* (Gotha); *Revue d'Anthropologie* (Paris); *Revue Mensuelle de l'Ecole d'Anthropologie de Paris* (ib.); *Revue d'Ethnographie* (ib.); *Verhandlungen der Berliner Gesellschaft für Anthropologie,* its organ being the *Zeitschrift für Ethnologie* (Berlin).

The following comprehensive works are more or less devoted to European ethnology: Keane, *Ethnology* (Cambridge, 1896); id., *Man, Past and Present* (ib., 1899); Ripley, *The Races of Europe* (New York, 1899); Deniker, *The Races of Man* (London, 1900); Macnamara, *Origin and Character of the British People* (ib., 1900); G. and A. Mortillet, *Le préhistorique; origine et antiquité de l'homme* (Paris, 1900); Giuseppe Sergi, *The Mediterranean Race* (London, 1901); Obermaier, *Der Mensch der Vorzeit* (Berlin, 1912); Birkner, *Die Rassen und Völker der Menschheit* (ib., 1913). Among recent articles the following are of special interest: Von Luschan, "Beiträge zur Anthropologie von Kreta," *Zeitschrift für Ethnologie,* pp. 307-393 (Berlin, 1913); id., "The Early Inhabitants of Western Asia," *Journal of the Anthropological Institute,* pp. 221-244 (London, 1911).

EUROPEAN CONCERT OF POWERS. This term is applied to the system of international politics which was actually in vogue from 1815 to 1822 and theoretically after the latter date. The first intimation we have of the idea is to be found in the sixth article of the Treaty of Chaumont signed Nov. 20, 1815, after a quarter century of bloody warfare. It ran as follows: "In order to consolidate the intimate tie which unites the four sovereigns (England, Russia, Austria, and Prussia) for the happiness of the world, the High Contracting Powers have agreed to renew at fixed intervals, either under their own auspices or by their respective ministers, meetings consecrated to great common objects and to the examination of such measures as at each one of these epochs shall be judged most salutary for the peace and prosperity of the nations, and the maintenance of the tranquillity of Europe." The Congress of Aix-la-Chapelle (1818) admitted France to the Concert and apparently the nations were all working in harmony. Soon after a disintegrating trend is noticed. By the protocol of Troppau (1820) Austria, Russia, and Prussia made the aim of the Concert synonymous with Metternich's reactionary policy. This was particularly displeasing to England and France, which were liberal countries. The final break came when Great Britain refused to become a party to the Congress of Verona, which authorized France to send an army into Spain to quell a constitutional uprising. The attempt to govern Europe by the Concert system failed because the doctrine of nationalism and the modern idea of a "State" promulgated by the French Revolution had finally come into their own on the Continent.

As an outgrowth of the foregoing system, Europe in recent years was divided into two rival alliances. The first the Triple Alliance (q.v.), signed (1882) by Germany, Austria, and Italy, and the second the Triple Entente, signed first by France and Russia (1891-95) and later by France and England (1904). Before the admission of England the former was a far more formidable agreement than the latter. Unquestionably the balance of power of Europe was preserved by these two opposite divisions. Several times previous to the war of 1914 the near Eastern question almost precipitated a far-reaching European conflict. The greatest crisis was in 1908, immediately following the Young Turkish revolution. Austria announced the complete annexation of Bosnia and Herzegovina. The Triple Entente raised a strong protest, but the weak condition of Russia and the mobilization of Germany's wonderful armament on the French and Russian frontiers effectively stopped all argument. The struggle in the Balkans (q.v.) caused the two alliances to be harmonious in one respect at least. England, Germany, France, Russia, and Italy determined that Austria should not expand southward and absorb the entire Balkans, which are her only outlet. They feared a strong Mediterranean power which could be very easily maintained by one nation on that peninsula. The five other members were also determined that Russia should not get control of the Dardanelles, for here again the supremacy of the other nations on the Mediterranean would be seriously threatened by so great an enhancement of Russia's power.

The outbreak of the European crisis in July, 1914, after the declaration of war on Servia by Austria, put the Concert to a severe test. From the very beginning, disintegrating influences, as well as new alliances, were strikingly apparent. Italy refused to be bound by the Triple Alliance and claimed she would enforce her neutrality by strength of arms if necessary. The *rapprochement* with Austria has always been unpopular with the Italians, and was only entered into because of the fear of French encroachments. The offer of a strip of territory in northern Africa was not tempting enough for her to cast her lot with Germany and thus draw upon herself the strength of the unquestionable masters of the Mediterranean, England and France. Another feature of this situation was the alignment of almost all of the other European nations with the Triple Entente against Germany and Austria. In the Balkans, Servia, Montenegro, and Greece were actually at war, and Bulgaria threatening to attack Turkey, if she aided Germany. Portugal decided to help Great Britain, and Belgium was fighting Germany to protect her neutrality. Holland and Denmark declared that they would appeal to arms if their territory was violated.

Spain and Italy refused offers of aggrandizement to help the German Emperor, and so he was left along with Austria to struggle against an almost unified Europe. In August, 1914, one phase yet to be worked out was to see whether Russia's treaty obligations would cement her with Great Britain throughout the crisis, or whether she would attempt to realize her desire for the Dardenelles, while Great Britain was engaged with Germany and possibly unable to maintain the integrity of European Turkey. See War in Europe.

EU'ROPHEN. An amorphous yellow powder containing 27.6 per cent of iodine, which it sets free under the influence of heat and moisture. Its action is similar to that of iodoform, to which it is preferred on account of its rather aromatic odor. It is insoluble in water, but dissolves freely in alcohol, ether, chloroform, and oils.

EURO'PIUM. A chemical element contained, in exceedingly small quantities, in monazite sand and, as shown by spectrum analysis, in the chromosphere of the sun and in other heavenly bodies. In monazite sand it is associated with a number of other elements of the "rare earth" group, including cerium, lanthanum, neodymium, praseodymium, samarium, gadolinium, and terbium, and a complex series of operations are required to separate it from these, the methods having been worked out by Demarçay, Urbain and Lacombe, and Eberhard. The symbol of europium is Eu; its atomic weight, as determined by Jantsch in 1908, is 152. In its metallic state the element is still unknown. Its oxide, Eu_2O_3, is obtained in the form of a pinkish powder. Its sulphate, $Eu_2(SO_4)_3 + 8H_2O$, forms pale-pink crystals, soluble in water.

EURO'TAS (Lat., from Gk. Εὐρώτας), the modern Iri. In ancient geography, a river of southern Greece, rising in the southern Arcadian Mountains and flowing in a southerly direction through Laconia, traversing the fertile valley between Mount Malevo and Taygetus, and falling into the Gulf of Laconia. The cities of Sparta and Amyclæ, celebrated in Greek mythology, were situated on the Eurotas.

EUROTIUM, û-rō'shĭ-ŭm. The generic name of one of the most common molds. It appears on bread, preserves, etc., and is commonly known as the herbarium mold. The generic name more frequently used now is *Aspergillus*. See Phycomycetes.

EU'RUS (Lat., from Gk. Εὖρος). The southeast wind; in later Greek legend, the son of Astræus and Eos.

EURYALE, û-rī'*a*-lê (Neo-Lat., from Gk. *εὐρύαλος, euryalos*, with wide threshing floor, from *εὐρύς, eurys*, broad + *ἅλως, halōs*, threshing floor). A genus of plants of the family Nymphæaceæ, or water lilies, closely allied to Victoria (q.v.), although of a very different appearance. *Euryale ferox*, the only species, is a water lily native to India and China, with small red or violet-colored flowers, leaves from 1 to 4 feet in diameter, the leafstalks and calyces covered with stiff prickles. The fruit is round, soft, pulpy, and of the size of a small orange, composed of a number of carpels, and containing round black seeds as large as peas, which are full of starch and are used to thicken soups or are eaten roasted. The rootstock also contains starch, which may be separated and used for food; the root itself is also eaten. The plant, which is said to have been in cultivation in China for upward of 3000 years, is more hardy than the *Victoria regia* and will endure the temperatures of the latitude of Philadelphia, reproducing itself from self-sown seeds in ponds. The whole plant is formidably spiny, whence its specific name, *ferox*.

EURYBIADES, û'rĭ-bī'*a*-dêz (Lat., from Gk. *Εὐρυβιάδης*). A Spartan naval hero. He was in command of the Spartan fleet and afterward nominal commander of all the Greek vessels sent out against the Persians in 480 B.C. To him and to Themistocles (q.v.) is credited the Greek victory of Salamis (q.v.).

EU'RYCLE'A (Lat., from Gk. *Εὐρύκλεια, Eurykleia*). A slave in the household of Laërtes and the nurse of Odysseus. On his return in the garb of a beggar she recognized him by a scar while washing his feet and secretly reported his return to Penelope. Consult *Odyssey*, xix, 385 ff.

EURYDICE, û-rĭd'ĭ-sê (Lat., from Gk. *Εὐρυδίκη, Eurydikē*). The wife of Orpheus (q.v.). When she died from the bite of a serpent, her husband followed her into the lower world, where he so charmed Hades with the music of his lyre that he was permitted to take Eurydice back to earth on condition that while on his way to the upper world he would not look behind him. Just as he reached the exit he disobeyed, and Eurydice vanished into the darkness. For a beautiful version of the story, consult Vergil, *Georgics*, iv, 453–527. Hermes, Orpheus, and Eurydice are represented on a very beautiful Greek relief of the end of the fifth century B.C., of which copies are in Naples, Paris, and Rome.

EURYL'OCHUS (Lat., from Gk. *Εὐρύλοχος*). One of the companions of Odysseus. He alone escaped when the others were turned into swine by Circe (q.v.). On the island of Thrinacia he induced his companions to slaughter the cattle of Helios, which resulted in the destruction of all the ships. See Ulysses.

EURYM'ACHUS (Lat., from Gk. *Εὐρύμαχος*). The son of Polybus, and one of the boldest of the suitors of Penelope, slain with the other suitors by Odysseus. See Ulysses.

EURYM'EDON (*Εὐρυμέδων*). An Athenian general in the Peloponnesian War. In 428 B.C. he commanded a fleet at Corcyra. In 427 he ravaged the Territory of Tanagra. In 425 he was appointed, with Sophocles, son of Sostratides, to command an expedition aimed at Sicily. On reaching Sicily, Eurymedon and Sophocles concluded terms of peace with Hermocrates. These terms displeased the Athenians, who charged that the treaty was brought about by bribery; Eurymedon was sentenced to pay a heavy fine. In 414 he was sent to reënforce the Athenians at Syracuse, but was defeated and slain before reaching land.

EURYNOME, û-rĭn'ô-mê (Lat., from Gk. *Εὐρυνόμη*). The daughter of Oceanus and mother by Zeus of the Charites, or of Aropus. She was the wife of the Titan Ophion, who ruled Olympus, but with his wife was cast down to Tartarus by Cronus. She had a temple at Phigalia, where her statue—half woman, half fish—was preserved, and where she was popularly identified with Artemis.

EURYPTERIDA, ŭ'rĭp-tĕr'ĭ-dȧ. A class of extinct Arachnoidea, related to the horseshoe crab on the one hand and the scorpions on the other. They appear in the Cambrian period, reach their greatest development in the Silurian. and decline in the Devonian and Carboniferous. disappearing with a small form found in the

Permian rocks of Portugal. In the Silurian, before the ascendancy of the fishes, they were the terrors and monsters of the sea and attained a length of 10 feet or more, as in *Pterygotus buffaloensis* of the water-lime beds of New York. These gigantic aquatic arachnids probably originated in the sea, but later flourished in the estuaries and lagoons of the shallow coasts, and finally became adapted to fresh-water conditions. In appearance they are distinctly archaic, especially the type of the class, *Eurypterus*, with its relatively small broad cephalothorax and evenly segmented abdomen; there is resemblance to a primitive crustacean, to which the eurypterids have long been referred. Some are somewhat fishlike in outline (*Hughmilleria*), others with their spreading legs resemble gigantic spiders (*Stylonurus*), and others again are distinctly scorpion-like (*Eusarcus*) by reason of their abruptly set-off tail and curved tail spine.

The body of the eurypterids consists of a broad semicircular or semielliptic cephalothorax which bears on the upper side a pair of faceted or smooth lateral eyes and a pair of ocelli on the apex; on the underside are two prehensile cheliceræ in front of the mouth, which in *Pterygotus* grow into immense serrated pincers; and five pairs of legs. The last pair of them in *Pterygotus*, *Eurypterus*, and *Eusarcus* is formed into paddles that served as swimming organs and to anchor the creatures to the mud. The bases of the legs (gnathobases) that surround the mouth are provided with teeth. A large elliptic or oval plate, the metastoma, which corresponds to the chilaria of *Limulus*, is attached posteriorly of the mouth. It is a characteristic organ of the eurypterids. The abdomen consists of 12 segments and a telson; the anterior six segments consist of rather flat dorsal plates (tergites), to which are attached five pairs of broad, leaflike appendages, corresponding to the operculum and branchial appendages of *Limulus*. The operculum bears genital appendages of two different forms which permit the distinction of the sexes. The six posterior segments are annular. The telson is either a long spine or a broad oval rudder, bilobed in *Erettopterus*. The surface is marked by very characteristic scales.

The eurypterids are divided into two families—the Eurypteridæ with smooth eyes and small chelicerae (genera *Eurypterus*, *Tylopterus*, *Onichopterus*, *Eusarcus*, *Dolichopterus*, *Drepanopterus*, *Stylonurus*, *Anthraconectes*) and the Pterygotidæ with faceted eyes and large chelicerae (*Hughmilleria*, *Pterygotus*, *Erettopterus*, *Slimonia*). Their remains occur in the Ordovician rocks of eastern North America, the Silurian rocks of the United States, the Old Red Sandstone of Scotland, the coal measures of Pennsylvania and Illinois, and the Carboniferous strata of Dakota, Scotland, Brazil, and South Africa. Some paleontologists see in the eurypterids the invertebrate ancestors of the fishes, and thereby of the vertebrates in general. See illustration in article MEROSTOMATA.

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EURYP′TERUS. See EURYPTERIDA.

EURYP′YLUS (Lat., from Gk. Εὐρύπυλος). 1. King of the Meropes in Cos, and son of Poseidon and Astypalæa. He was killed by Heracles, with the assistance of Zeus. His daughter Chalciope became by Heracles the mother of Thessalus. 2. The son of Telephus and Astyoche, sister of Priam. He went to the aid of the Trojans and after heroic deeds was slain by Neoptolemus (q.v.). 3. The son of Euæmon, King of Ormenium, in Thessaly, and one of the suitors of Helen. He went to Troy with 40 ships and received as his share, at the division of the Trojan booty, a chest preserved by Dardanus, which contained an image of Dionysus, the work of Hephæstus himself. On opening the box Eurypylus was struck with madness, for the cure of which the Delphic oracle directed him to dedicate the chest where he should find an unknown form of sacrifice. On his return he found at Aroë, in Achaia, an unusual sacrifice to Artemis, consisting of the annual offering of a beautiful youth and maiden. Having abolished this worship, he substituted that of Dionysus Æsymnetes.

EURYSTHENES, ū-rĭs′the-nēz (Lat., from Gk. Εὐρυσθένης). One of the Heraclidæ, the son of Aristodemus. With his twin brother Procles he received Lacedæmon as his share of the Peloponnesus and ruled at Sparta in conjunction with his brother. Thirty-one kings of Sparta were of his family.

EURYS′THEUS (Lat., from Gk. Εὐρυσθεύς). A king of Mycenæ, to whose power Heracles was subjected by the craft of Hera and forced to undertake the Twelve Labors. Eurystheus was afterward defeated and killed by Hyllus, the son of Heracles. See HERCULES.

EUSE′BIAN CANONS. An ancient system of cross reference to the Gospels, found in very many biblical manuscripts. Long before the modern chapter and verse divisions came into use, a number of systems of text division were current. The one most generally used was that of Eusebius, the famous church historian (c.260–340). Either adopting or improving the work of Ammonius, an Alexandrian, Eusebius divided Matthew into 355 sections, Mark into 236, Luke into 342, and John into 232, the so-called Ammonian Sections, the number of each section being written on the margin of the text. On account of similarity of matter, many sections of one Gospel were nearly or quite identical with others in one or more of the other three. For conveniences of reference, Eusebius constructed 10 tables or lists, called canons. The first contained the numbers of all the sections common to all four Gospels arranged in parallel columns. The second, third, and fourth tables gave the sections common to three Gospels. The fifth to the ninth gave those common to two, while the tenth was made up of those contained in but one Gospel.

In manuscripts using the system, underneath each section number was written in red ink the number of the canon in which that section might be found. For example, the first line of canon i contained the section numbers 8, 2, 7, 10—i.e., the eighth section of Matthew contained the same matter as the second of Mark, the seventh of Luke, and the tenth of John. Hence, on the margin of the text of Matthew, opposite the eighth section, would be the figures (Greek letters being used) $\frac{\mathrm{H}}{\mathrm{A}}\left(=\frac{8}{1}\right)$, indicating that this section would be found in the first canon, and similarly for all the sections in all the Gospels. This widely used system was doubtless of great convenience in New Testament study. Consult Tischendorf, *Prolegomena* to the eighth edition of his Greek New Testament (Leipzig, 1884), and C. R. Gregory, *The Canon and Text of the New Testament*, pp. 470 ff. (New York, 1907).

EUSE′BIUS (Lat., from Gk. Εὐσέβιος) OF CÆSAREA (c.260–c.340). The father of ecclesiastical history. He was born in Palestine about 260. He took the surname of Pamphili from his friend and teacher, Pamphilus of Cæsarea, whose great library furnished much of the extensive historical sources Eusebius later used. Pamphilus ultimately met a martyr's death, and Eusebius had to flee for his life. He went to Egypt and was imprisoned there. In 313 he succeeded Agapius as Bishop of Cæsarea. At the Council of Nicæa (325) Eusebius made the opening address and was the leader of the semi-Arian or moderate party, who were averse to discussing the nature of the Trinity and preferred the simplicity of Scripture language to the metaphysical distinctions of either side. He was present at the synods of Antioch (330) and Tyre (335) and showed marked Arian leanings, though at Nicæa he had felt constrained to accept the Athanasian position. He stood in high favor with Constantine, who, it is said, declared that he was fit to be the bishop of almost the whole world. He died at Cæsarea about 340. Eusebius has the reputation of being the most learned of the Church fathers after Origen, though without his genius. His chief works are: 1. The *Chronicon*, a history of the world down to the celebration of Constantine's *Vicennalia* at Nicomedia and Rome in 327–328. It is particularly valuable for its extracts from old writers. 2. The *Præparatio Evangelica*, in 15 books, a collection of extracts from heathen authors fitted to prepare the way for Christianity. 3. The *Demonstratio Evangelica*, in 20 books, a work intended to convince the Jews of the truth of Christianity from the evidence of their own Scriptures. 4. The *Historia Ecclesiastica*, in 10 books, relating the principal occurrences in the Christian Church to the year 324. Unfortunately Eusebius omits everything derogatory to Christians, considering such matter not edifying. Eusebius' complete works are in Migne, *Patrologia Græca*, xix–xxiv. The *Præparatio* and *Demonstratio* were edited by Dindorf (Leipzig, 1867–71); the *Ecclesiastical History*, *Life of Constantine*, and *Oration in Eulogy of Constantine* by Heinichen (ib., 1868–70); the *Chronicon* by Schöne (Berlin, 1866–75). A critical edition of his works appears in the series *Griechische christliche Schriftsteller der ersten drei Jahrunderte* (Leipzig, 1902–03). The *Præparatio Evangelica*, with translation, was published by Gifford (Oxford, 1903). There is an English translation of the *History*, by A. C. McGiffert, in the *Nicene and Post-Nicene Fathers* (2d series, New York, 1890), with prolegomena and elaborate notes. Translations of some of the minor works also appear in the same volume. Consult Schöne, *Die Weltchronik des Eusebius in ihrer Bearbeitung durch Hieronymus* (Berlin, 1900), and for a critical discussion of the text of the *Martyrs*, Violet (Leipzig, 1896) and Harnack (Essen, 1898). Consult also Harnack, *Geschichte der altchristische Literatur* (Leipzig, 1893).

EUSEBIUS OF EMESA (c.300–359). A Semi-Arian bishop. He was born at Edassa, about 300. He was a pupil of Eusebius of Cæsarea and also studied at Alexandria. Averse to theological controversy, he declined the bishopric of Alexandria after the deposition of Athanasius. Later, however, he was appointed Bishop of Emesa (the modern Homs) and filled the post, notwithstanding opposition, sometimes violent, on account of his semi-Arian sympathies. He was also accused of Sabellianism, and his astronomical knowledge made him suspected of sorcery. (See SABELLIUS.) He was a favorite of the Emperor Constantius, accompanied him on his expedition against the Persians in 338, and spent much of his time thereafter in attendance upon the Emperor. He died at Antioch in 359. His reputed works are in Migne, *Patrologia Græca*, lxxxvi, and his homilies were published by Augusti (Elberfield, 1829). Many of these are undoubtedly spurious. Consult Thilo, *Ueber die Schriften des Eusebius von Alexandrien und des Eusebius von Emesa* (Halle, 1859).

EUSEBIUS OF NICOMEDIA (?–342). An Arian leader, Patriarch of Constantinople. He was born towards the close of the third century and was related to the Imperial family. He was educated in the schools of Antioch, Arius (q.v.) being a fellow pupil. He became Bishop of Berytus (Beirut), in Syria, and later of Nicomedia. At the Council of Nicæa he appeared as a defender of Arius, and, like his namesake of Cæsarea, advocated compromise. Later he placed himself at the head of the Arian party. In 339 he was made Patriarch of Constantinople. In 341 he held an assembly of the Church at Antioch, for the purpose of establishing Arianism. He died soon after, in either that year or the following. Eusebius is said to have been ambitious and avaricious, and unscrupulous in the means adopted to secure his ends. It must be borne in mind, however, that no writings of the Arian party are preserved, and all our knowledge is from their opponents, the orthodox party. The Arians are sometimes called Eusebians.

EUSEBIUS EM′MERAN. See DAUMER, GEORG FRIEDRICH.

EUSKALDUN, ū′skȧl-dōōn′. See BASQUE.

EUSKIRCHEN, ois′kĭr-ken. A town and railway junction, capital of a circle in the Rhine Province, Prussia, 15 miles west of Bonn (Map: German Empire, B 3). It is a thriving industrial centre; manufactures cloth, sugar, white lead, hosiery, leather goods, furniture, art objects, machinery, pottery, malt, beer, brandy, flour, and meal. Pop., 1900, 10,285; 1910, 12,413.

EUSPORANGIATES, ū′spō-răn′jĭ-āts. A name given to those groups of plants whose sporangia originate beneath the surface of the body rather than from the surface. They include the seed plants and also all of the Pteridophytes excepting the common ferns.

EUSTACHIAN (ū-stā′kĭ-*a*n) **TUBE.** See EAR.

EUSTACHIO, ā-ōōs-tä′kē-ō, BARTOLOMMEO (?–1574). An Italian anatomist, born in the early part of the sixteenth century. His birthplace is not known with certainty. In 1562 he was professor of medicine in the Collegio della Sapienza at Rome. His name is indelibly associated with anatomical science, through his description of the Eustachian tube (see EAR) and the rudimentary valve in the heart, which are named after him. He was the first to give an accurate description of the thoracic duct and was probably the first to notice and describe the stapes (one of the chain of small bones crossing the tympanic cavity of the ear)—a discovery which, however, Fallopius assigns to Ingrassias. He likewise contributed materially to the diffusion of more accurate knowledge regarding the development and evolution of the teeth and the structure of the kidney. These discoveries are recorded in his *Opuscula Anatomica*, published at Venice in 1563. The *Tabulæ Anatomicæ* did not appear until 1714, when they were edited, with explanatory remarks, by Lancisi. Eustachio, Vesalius, and Fallopius may be regarded as the founders of modern anatomy. See ANATOMY.

EUSTACHIUS, ū-stā'kĭ-ŭs, or **EUSTATHIUS**. A Roman saint and martyr of the second century. According to the legend, his name was Placidus. The legend adds that he was converted, while engaged in the chase, by suddenly beholding between the antlers of a deer a vision of Christ, which thus addressed him: "Why dost thou follow me, who desire thy salvation?" He suffered martyrdom in Rome under Hadrian and is regarded by the Roman Catholic church as the patron of the chase. His day is September 20.

EUSTA'THIUS (Lat., from Gk. Εὐστάθιος) OF ANTIOCH (?–c.340). A bishop of Antioch, born at Side, Pamphylia. At the Council of Nicæa he was exceedingly hostile to the Arians, in consequence of which he was deposed (331) upon their accession to power. He was subsequently banished to Illyria, and finally to Thrace, where he died. Of his numerous writings only a work against Origen and a few fragments of other volumes remain.

EUSTATHIUS (c.300–c.380). A Semi-Arian bishop of Sebaste, in Armenia, into which country he introduced monasticism. The ascetics and celibates known as Eustathians are supposed to have derived their name and their religious practices from him. They were condemned in 340 by the Synod of Gangra. He was also the founder of a hospital for the poor at Sebaste, which he placed in charge of his friend Ærius. Although constantly attacked by the orthodox churchmen, he retained his see, through the friendship of Constantine. He was deposed in 358 by the Synod of Melitene. Consult Loofs, *Eustathius von Sebaste* (Halle, 1898).

EUSTATHIUS. A celebrated Byzantine commentator on Homer, on the geographical epic of Dionysius the Periegete, and on Pindar. He was born probably at Constantinople in the early part of the twelfth century; became a monk, later a deacon in the church of St. Sophia, and in 1175 was appointed Archbishop of Thessalonica, where he died between 1192 and 1194. He is best known for his great commentary on the *Iliad* and the *Odyssey*, which, in spite of its diffuseness and digressions, is a valuable treasure house of ancient learning; but since the discovery and publication of the Homeric Scholia its importance has been much diminished. His chief sources were the extant Homeric Scholia, rhetorical lexica, Suidas, the Etymologicum Magnum, Athenæus, Ælius Dionysius, Aristophanes of Byzantium, Pausanias, Stephanus of Byzantium, Suetonius, and Heraclides of Miletus. The commentary was first published in Rome in 1542; it was last edited by Stallbaum (7 vols., Leipzig, 1825–30). The paraphrase and commentary to *Dionysius the Periegete* is of little value, except for what it preserves of Stephanus of Byzantium and of lost writings by Arrianus. It is best published by Bernhardy, in his edition of *Dionysius* (Leipzig, 1828). Of the commentary to *Pindar* only the introduction is preserved. This contains a life of Pindar, and a discussion of lyric poetry and of the Olympic Games. It was edited with commentary by Schneidewin (Göttingen, 1837). Eustathius also left a considerable number of historical writings, speeches, and tracts, important for a knowledge of his times, and of the inner history of the Greek monasteries in the twelfth century. Of these the greater part are published in Migne, *Patrologia Græca*, vols. cxxxv and cxxxvi. Consult Krumbacher, *Byzantinische Litteraturgeschichte* (Munich, 1897), and Cohn, the article "Eustathios, 18," in Pauly-Wissowa, *Real-Encyclopädie der classischen Altertumswissenschaft*, vol. vi (Stuttgart, 1909).

EUSTATHIUS, or **EUMATHIUS**, also known as MAKREMBOLITES. A Byzantine erotic writer or novelist of the twelfth century A.D. He seems to have been a native of Parembole in Egypt and is referred to in the manuscripts of his work as chief keeper of the archives there. The novel by him is probably the latest Greek production of its kind known. It consists of 11 books and is a story of the love of Hysminias and Hysmine (published in the *Scriptores Erotici* of Le Bas, Paris, 1856; also by Hercher, Leipzig, 1859, and by Hilberg, Vienna, 1876). The style of the novel is somewhat artificial, and the story decidedly improbable and of a very sensual character. Consult Rohde, *Der griechische Roman* (2d ed., Leipzig, 1900).

EUSTATIUS (ū-stā'shĭ-ŭs) **ISLAND**, or ST. EUSTACHE ISLAND (Statia). One of the Lesser Antilles, lying northwest of St. Christopher, a Dutch dependency of the island of Curaçao (Map: West Indies, G 3). The chief town is Orangetown. It has an area of 7 square miles and a population (1902) of 1484.

EUS'TIS, JAMES BIDDLE (1834–99). An American lawyer and legislator. He was born in New Orleans, graduated at the Harvard Law School in 1854, and was admitted to the New Orleans bar in 1856. During the Civil War he served in the Confederate army as judge advocate on the staffs of Generals Magruder and Johnston and afterward was one of the commissioners sent by Louisiana to confer with President Johnson with regard to the "reconstruction" of that State. He served for several terms in the State Legislature and was afterward twice sent to the United States Senate, serving from 1877 to 1879 and again from 1885 to 1891. From 1879 to 1884 he was professor of civil law in the University of Louisiana and from 1893 to 1897, after his second term in the Senate, was United States Minister and first United States Ambassador to France. After returning in 1897 he practiced law in New York until his death.

EUSTIS, WILLIAM (1753–1825). An American physician and politician. He was born at

Cambridge, Mass., graduated at Harvard in 1772, studied medicine with Joseph Warren, and served as a surgeon in the Revolutionary army. He served in the Massachusetts Legislature and Governor's Council and two terms (1801–05) in Congress as a Democrat, was Secretary of War in President Madison's cabinet from 1809 to 1813, and was Minister to Holland from 1814 to 1818. On his return he was again a member of Congress from 1820 to 1823 and from 1823 until his death was Governor of Massachusetts.

EU′TAW. A town and the county seat of Greene Co., Ala., 90 miles west-southwest of Birmingham, on the Alabama Great Southern Railroad (Map: Alabama, B 3). It has an oil mill, ginneries, a lumber mill, and a cotton compress. Eutaw, established in 1838, was named in honor of General Greene's victory at Eutaw Springs in the Revolution. Pop., 1900, 884; 1910, 1001.

EUTAW SPRINGS, Battle of. A battle of the American Revolution, fought on Sept. 8, 1781, about 60 miles northwest of Charleston, S. C., between about 2000 Americans under General Greene and about 2300 British under General Stuart. The battle consisted of two engagements, in the first of which, beginning at about 4 A.M., Greene was victorious; while in the second the British, having rallied, beat off all further attacks. During the night, however, Stuart retreated towards Charleston, and Greene slowly pursued. The battle, though tactically drawn, was an important strategic victory for the Americans, closing, as it did, Greene's famous campaign and compelling the British to shut themselves up in Charleston. The British lost in killed, wounded, and missing about 800 men, the Americans about 535.

EUTERPE, ū-tĕr′pē (Lat., from Gk. *Εὐτέρπη*, very delightful, from *εὖ*, *eu*, well + *τέρπειν*, *terpein*, to delight). One of the nine Muses, the daughter of Zeus and Mnemosyne. In the specialization of the functions of the Muses, which occurred in later times, Euterpe was made guardian of flute playing and was represented as holding a flute.

EUTHANASIA, ū′thȧ-nā′zhĭ-ȧ (Neo-Lat., from Gk. *εὐθανασία*, easy death, from *εὖ*, *eu*, well + *θάνατος*, *thanatos*, death, from *θανεῖν*, *thanein*, to be dead). An easy death, or a painless method of putting to death. The use of narcotics or other means for shortening life, in disease, has become a subject of discussion in civilized countries; and it is often a very practical question as to how far such means are admissible for soothing the last hours of life, when the approach of death does not of itself dull the consciousness and the sensibility to pain. It must be decided according to all the surrounding circumstances, medical and otherwise, in each individual case. The law, medical ethics, and religious teaching alike condemn euthanasia. The law stigmatizes deliberate putting to death or aiding in the same as murder, and physicians know that apparently doomed patients often recover.

EUTHE′RIA. A subclass of the Mammalia, embracing all mammals except the monotremes (*Prototheria*). This subclass is characterized by being viviparous, with a small ovum and an allantoic placenta, and by having teats. Whether certain of the most primitive fossil remains, more or less doubtfully attributed to the Mammalia, are to be placed here or among the Prototheria, is still a subject of inquiry. Consult Beddard, "Mammalia," in *Cambridge Natural History*, vol. x (London, 1902). It is unfortunate that, in addition to the above use of Eutheria by Gill, Osborn, and Beddard, the same word was used by Huxley, as including the Placentalia alone; and this usage is widely disseminated through the literature of the subject. The term Theria has recently been used by several authors (Parker and Haswell, and Gregory) as the equivalent of Gill's Eutheria. Consult Gregory, "The Orders of Mammals," *Bulletin American Museum of Natural History*, vol. xxvii (New York, 1910).

EUTHYMI′US (Lat., from Gk. Εὐθύμιος), Slav. *Evthimii* (?–c.1393). A Bulgarian patriarch and religious writer, pupil of the Patriarch Theodosius. He lived for some time as a monk on Mount Athos, but, having incurred the enmity of the Byzantine Emperor John V Palæologus, he withdrew to the vicinity of Trnovo (Tirnovo), the capital of the second Bulgarian Empire and seat of the Bulgarian Patriarch. There he led a saintly life, revising the Slavic service books and directing the monks who flocked around him. About 1375 he was elected Patriarch. From his see he preached against the Bogomiles and other heretics. Nothing is known of his life after the taking of Trnovo by the Turks. His original works include lives of saints, eulogies of prominent churchmen, and pastoral epistles. All his writings evince an overwhelming Byzantine influence, which manifests itself not only in his style and ideas, but also in his syntax and orthography. To his Slavic contemporaries this seemed a happy innovation, and Euthymius became the head of a religious literary school which for a long time held sway over Bulgaria, Servia, Russia, and Rumania.

EUTHYMI′US (Lat., from Gk. Εὐθύμιος) **ZYGADENUS** (?–c.1118). A Greek monk and scholar, highly esteemed by the Emperor Alexis Comnenus. He wrote some very dry theological works; the principal one of these is an enumeration of all the heresies from Simon the Magician to his own time—*Πανοπλία Δογματική* (first Latin edition in 1555; there was an imperfect Greek edition in 1711). His works were printed in Migne, *Patrologia Græca*, vols. cxxviii and cxxxi (Paris, 1864).

EUTING, oi′tĭng, Julius (1839–1912). A German Orientalist and epigraphist. He was born at Stuttgart and studied theology and Oriental languages at Tübingen, Paris, London, and Oxford. In 1871 he was appointed chief librarian at the Imperial University and Government Library at Strassburg and in 1900 director of that institution. He retired in 1909. As a result of his travels in Europe and the Orient, he accumulated a vast number of ancient Semitic inscriptions, which he gave to the University of Strassburg. His publications include: *Sechs Phönikische Inschriften aus Idalion* (1875); *Beschreibung der Stadt Strassburg und des Münsters* (1881; 15th ed., 1909); *Nabatäische Inschriften aus Arabien* (1885); *Sinaitische Inschriften* (1891); *Tagebuch einer Reise in Inner-Arabien* (1896); *Mandaischer Diwan* (1904).

EUTRO′PIUS. A Latin historian, concerning whom we know only that he filled the office of secretary to the Emperor Constantine, at Constantinople, fought under Julian against the Persians (363), and was still alive in the reign of Valens (364–378). The date of his death is unknown. His *Breviarium ab Urbe Condita*.

giving a short narrative of Roman history from the foundation of the city to the time of the Emperor Valens, is written in an extremely simple and pure style and appears to have been originally intended for the use of schools. It rests on good authorities. An edition, with enlargements, however, was published by Paul, son of Warnefrid and Theodolinda, generally known as Paulus Diaconus (q.v.). Others continued it down to the year 813. At the revival of letters the history existed in three distinct forms. There was first the genuine work of Eutropius, in 10 books; second, the expanded edition of Paul; and third, a very complete but also interpolated copy in the *Historia Miscella*. The *editio princeps*, printed at Rome in 1471, was from the text of Paul. The best modern editions are those of Droysen (Berlin, 1879) and Ruehl (Leipzig, 1887). There is an edition with English notes, by Hazzard (New York, 1898). A Greek version of the *Breviarium*, by Pæanius, is extant and is to be found in Droysen's book. Consult Teuffel, *Geschichte der römischen Litteratur*, by Kroll and Skutsch, vol. iii (6th ed., Leipzig, 1913).

EUTROPIUS (?–399). High Chamberlain of the Emperor Arcadius. He was a eunuch and came originally from Armenia. He subsequently became attached to the Imperial court and gained the favor of his master by bringing about the marriage of the latter with Eudoxia, by whom he was installed as the successor of the Minister Rufinus (395). He was the chief adviser of Arcadius and become notorious for his cruelty and avarice. In 397 he procured the enactment of the law of Arcadius against treason (intended to guard against a popular uprising, and later embodied in the codes of Theodosius and Justinian), which provided that in case of high treason even the children of the accused were to be punished. He was deposed in 399, exiled to the island of Cyprus, and subsequently beheaded. Consult *The Cambridge Mediæval History*, vol. i (New York, 1911).

EUTYCHES, ū'tĭ-kēz (Lat., from Gk. Εὐτύχης). A monk of the fifth century, archimandrite of a cloister near Constantinople, who in his old age taught views respecting the nature of Christ which were condemned as heretical. He possessed little education, but was fond of doctrinal controversy, in which the whole Church at that time was engaged. His peculiar teaching was a development of the Alexandrian Christology. He held that two natures, one divine and one human, went to make up the person of Christ, but that after their union in the incarnation there was only one nature, so that Christ was "from" two natures, but not "of" two natures. He was unwilling even to admit that Christ's physical body was like that of ordinary men. Thus his theory tended to dissolve the true humanity in the divinity of Christ.

At a synod held at Constantinople in 448, under Flavian, Bishop of Constantinople, Eutyches was charged with heresy by Eusebius of Dorylæum and condemned. Under Alexandrian influence the Emperor was persuaded to summon a council which should review the case of Eutyches. This council met at Ephesus in 449 and is known as "The Robber Synod," from the riotous character of its proceedings. (See EPHESUS, COUNCILS OF.) By the aid of armed soldiers and excited monks Flavian was condemned and Eutyches rehabilitated. But the Church at large properly refused to recognize as final the verdict of this disgraceful assembly, and a change in emperors made its reversal politically possible. Under Pulcheria and Marcian the Fourth Ecumenical Council was held at Chalcedon (451), and there the doctrine of the two natures in Christ was declared to be an article of the Catholic faith. Eutychianism was again condemned, and Eutyches himself, now 73 years old, was excommunicated and banished. We hear of him for the last time two years later, when he was still in exile. His followers continued their separate existence for a time, having monasteries of their own, but were soon absorbed in the Monophysites (q.v.), who composed a large majority of the Eastern church. See LEO I, and consult: Hefele, *History of the Councils*, iii (Eng. trans., London, 1883); Harnack, *History of Dogma*, vol. iv (Boston, 1899); Du Bose, *The Ecumenical Councils* (New York, 1897).

EUTYCHIANUS, ū-tĭk'ĭ-ā'nŭs, SAINT. Bishop of Rome, 275–283, reckoned twenty-seventh in the list of the popes. His day is December 8.

EUTYCH'IDES (Εὐτυχίδης). A Greek sculptor of the latter part of the fourth century B.C., pupil of Lysippus. He was born at Megara. His most famous work was a statue of Fortune, made for the city of Antioch; it pictured the goddess as wearing a crown of towers and seated on a rock, with the river Orontes at her feet. The work, which was copied for other Asiatic cities, is known through a small copy in the Vatican. It has been suggested that the famous "Victory of Samothrace" is a work of Eutychides.

EUX'INE, ūks'ĭn (Lat. *Euxinus*, from Gk. εὔξεινος, *euxeinos*, hospitable, from εὖ, *eu*, well + ξεῖνος, ξένος, *xeinos*, *xenos*, stranger). The name applied by the ancients to the Black Sea. It is said to have been called in very early times the *Axenos Pontos*, the *Inhospitable Sea*, by reason of the roughness of its waters and the wildness of the savage tribes that lived on its borders, but to have had its name changed after the Greek colonies were founded in that region. Possibly, however, we are to explain the name *Euxine* as a euphemism for *Axine*. For such euphemistic names, see DURAZZO; EUMENIDES.

E'VA, LITTLE. The friend of Uncle Tom in Mrs. Stowe's *Uncle Tom's Cabin*.

EVAD'NE (Lat., from Gk. Εὐάδνη). The daughter of Iphis, King of Argos, celebrated for her love of her husband Capaneus. Evadne was burned alive on Capaneus' funeral pyre.

EVAG'ORAS (Lat., from Gk. Εὐαγόρας). A king, or despot, of Salamis in Cyprus, a reputed descendant of Teucer. He became King in 410 B.C. and is described by Isocrates in his *Panegyric* as being a just and wise ruler, who aimed to promote the welfare of his people. He cultivated the friendship of the Athenians, and, after the defeat of the Athenians at Ægos-Potami, offered Conon a place of refuge at his court. Being attacked by the Persians, he allied himself with the Athenians and the Egyptians, but was in the end made tributary prince to the Persians. He was assassinated in 374 B.C. and was followed on the throne by his son Nicocles.

EVA'GRIUS (Lat., from Gk. Εὐάγριος, *Evagrios*) (c.536–?). An early Church historian, surnamed Scholasticus. He was born at Epiphania in Cœle-Syria in 536 or 537. He was an advocate at Antioch and the legal adviser of the

Patriarch Gregory. The Emperor Tiberius II made him a quæstor, and Mauritius, the son of Tiberius, made him prefect. His influence and reputation at Antioch were great, and on the occasion of his second marriage he was given a public festival by the citizens. The date of his death is unknown. Evagrius wrote an *Ecclesiastical History* for the years 431–594, which has value not only for Church history, but also for secular. It forms the last of the continuations of Eusebius' *History*. It is in Migne, *Patrologia Græca*, lxxxvi, and there is an English translation by Hanmer (London, 1577, reprinted in Bohn's *Ecclesiastical Library*). The Greek text with the scholia was edited by Bidez and Parmentier (London, 1898). Consult Krumbacher, *Geschichte der Byzantinischen Litteratur* (Munich, 1897).

EVALD, ā'vald, HERMAN FREDERIK (1821–1908). A Danish novelist. The more noteworthy of his novels are: *Valdemar Krone's Youth* (1860), a story of Danish aristocracy; *The Nordby Family* (1862); *Johannes Falk* (1865); *Charles Lyng* (1882), showing him at his best in the drawing of character; *The Swedes at Kronborg* (1867); *Anna Hardenberg* (1880); *Clara Bille* (1892); *Leonore Kristine* (1895); *Klein Kirsten* (1901); *Bondebruden* (1904)—all historical novels of merit.

EVALD, JOHANNES (1743–81). The greatest lyric poet of Denmark, born at Copenhagen. His poetry, such as *The Temple of Fortune* (1764), and *Elegies* (1766) on the death of Frederick V, brought him deserved fame, and his biblical drama, *Adam and Eve* (1769), was up to that time the best poem in Danish, as his *Rolf Krake* (1770) was the first original Danish tragedy. His next decade was very productive in tragedy, comedy, and farce, and closed with a drama, *The Fishers* (1779), the noblest of his works, in which, among other lyrics, is the Danish national song "King Christian Stood by the Lofty Mast." Already his health was giving way; the excitement of the first performance of his opera *The Fishers* was too much for him, and he died after some months of agony, cruelly neglected by his family, but solaced by his friends. The best edition of his *Works* is by Liebenberg (8 vols., Copenhagen, 1850–55), the best biographical study his own *Life and Opinions* (Copenhagen, 1792). For his biography, consult also Hammerich (Copenhagen, 1882) and Jorgensen (ib., 1888).

EVAN'DER (Lat., from Gk. Εὔανδρος, *Evandros*). According to Roman traditions, the son of Hermes by Carmenta or Tiburtis or Themis or Nicostrate. About 60 years before the Trojan War he is said to have led a Pelasgian colony from Pallantion in Arcadia to Italy, and to have landed on the banks of the Tiber, near the foot of the Palatine Hill. From his Arcadian home this settlement was named Pallanteum, or Palatium. Tradition represented Evander as having done much to civilize his neighbors by introducing trades and also knowledge of music and writing. To him is also ascribed the introduction of the worship of the Lycæan Pan, with that of Demeter, Poseidon, and Heracles, though Heracles is also said to have introduced his own worship when entertained by Evander after his battle with Cacus. Vergil represents Evander as being still alive when Æneas arrived in Latium after the sack of Troy; Evander's son Pallas fought for Æneas, but was slain by Turnus. Evander was worshiped both at Pallantion in Arcadia and at Rome. The story seems clearly devoid of any historical truth and to be merely a late invention to explain some similarities of worship and customs which were thought to exist between Rome and Arcadia. Consult: Schwegler, *Römische Geschichte* (Tübingen, 1867); Preller-Jordan, *Römische Mythologie* (3d ed., Berlin, 1881–83); Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

EVANGEL'ICAL (from *evangelic*, Lat. *evangelicus*, Gk. εὐαγγελικός, *euangelikos*, pertaining to the gospel, from εὐαγγέλιον, *euangelion*, gospel, from εὐάγγελος, *euangelos*, bringing good tidings, from εὖ, *eu*, well + ἀγγέλλειν, *angellein*, to announce). Properly, belonging to or based upon the gospel, and hence applied to anything which is marked by the spirit of the gospel of Jesus Christ. In popular use the term is employed by a portion of the Christian community to denote their own peculiar theological opinions, which are held to constitute the only true and complete expression of Christian belief. In general, it implies emphasis on the traditional Protestant theology and upon the element of feeling in religion. In England and Scotland dissenters have claimed to be more "evangelical" than the established churches. In the United States the term is appropriated by the more orthodox sects to distinguish themselves from the liberal bodies. In Germany all Protestants call themselves Evangelical, in opposition to the Catholics. The modern orthodox-pietistic party in the German churches has made exclusive claim to the designation "evangelical" on the ground that they alone hold to the gospel in its actual historic form. In England, after the Methodist revival, those in the Established church who shared in general its spiritual views formed a very numerous party and called themselves evangelical. They formed the great body of the Low Church party.

EVANGELICAL ADVENTISTS. See ADVENTISTS.

EVANGELICAL ALLI'ANCE. A voluntary association of Evangelical Christians belonging to various denominations and countries. It had its origin in a general and strong desire for a more practical union among Protestants to promote the cultivation of Christian fellowship and the extension of Christian faith. After full conference and correspondence the Alliance was formed in Freemason's Hall, London, Aug. 19–23, 1846, at a meeting of about 800 persons—Episcopalians, Presbyterians, Independents, Methodists, Baptists, Lutherans, Reformed, Moravians, and others representing England, Scotland, Ireland, Germany, France, Switzerland, the United States, and other countries. The following doctrinal articles were adopted, not as a binding creed, but as an expression of the substance of the gospel: 1. The divine inspiration, authority, and sufficiency of the Holy Scriptures. 2. The right and duty of private judgment in the interpretation of the Holy Scriptures. 3. The unity of the Godhead and the Trinity of the persons therein. 4. The utter depravity of human nature in consequence of the fall. 5. The incarnation of the Son of God, His work of atonement for sinners, and His mediatorial intercession and reign. 6. The justification of the sinner by faith alone. 7. The work of the Holy Spirit in conversion and sanctification. 8. The immortality of the soul, the resurrection of the body, the judgment of the world by our Lord Jesus Christ, with the eternal blessedness of the righteous and the eternal punishment of the wicked. 9. The divine institution of the Christian ministry and the obligation and perpetuity of the ordinances of baptism and the Lord's Supper. The organization thus commenced has since been extended throughout Protestant Christendom. Branch alliances have been formed in Great Britain, Germany, France, Switzerland, Sweden, the United States, Australia, and among missionaries in Turkey, India, Brazil, and Japan. The American branch was organized in 1867. These national branches are related to each other as members of a confederation having equal rights. The whole Alliance appears in active operation only when it meets in general conferences having the character of Protestant ecumenical councils, but claiming only moral and spiritual power. These have been held at London, 1851; Paris, 1855; Berlin, 1857; Geneva, 1861; Amsterdam, 1867; New York, 1873; Basel, 1879; Copenhagen, 1885; Florence, 1891; London, 1896 (celebration of the jubilee); London, 1907. The United States branch held a national conference at Chicago in October, 1893. One of the most effective of the general conferences was that at New York in 1873. The visible results of the Evangelical Alliance may be seen, in part, in its promotion of religious liberty wherever that has been restricted or assailed. Since its organization several cases of persecution have occurred in southern Europe under the operation of penal laws against Protestants. In these cases the influence of the Alliance has been successfully exerted to bring the persecution to an end. It has aided in bringing about changes in favor of religious liberty in Turkey, Sweden, the Baltic provinces of Russia, and Japan. Consult *Reports* of the conferences and Arnold, *History of the Evangelical Alliance* (London, 1897).

EVANGELICAL ASSOCIATION. A religious denomination formed originally among the Germans of Pennsylvania. It has grown and extended till it is represented in most parts of the United States and Canada and has gained a solid footing in Germany and Switzerland. Its founder, Jacob Albright, was born in Pennsylvania in 1759 and was a member of the Methodist Episcopal church. Observing the low condition of religious life among the German population around him, he undertook a work of reformation among them about 1790 and traveled as an evangelist. In 1800 he formed a class or society of his converts, which by 1807 had become large enough to make some organization desirable, and a conference was held at which Albright was unanimously elected Bishop. He died in 1808, leaving the association a growing body of much vigor. A book of discipline was published similar to that of the Methodist Episcopal church, and the name Evangelical Association of North America was adopted. Annual conferences were formed, and the first General Conference, consisting of all the elders, was held in 1816 in Union Co., Pa.

The doctrines and theology of the Evangelical Association are Arminian, and its 21 articles of religion do not differ in any essential point from the 25 articles of the Methodist Episcopal church. Its government, polity, and methods of worship likewise closely resemble those of the Methodist church, and it is represented in the Methodist ecumenical conferences. It has bishops, chosen by the General Conference for terms of four years; presiding elders, serving not more than four years consecutively in the same districts; classes, quarterly conferences, annual conferences, and the General Conference, the supreme judicatory, meeting every four years. The ministers are of two orders—deacons and elders—and the itinerant system prevails, the pastors being appointed to their stations from year to year, at the meetings of the annual conferences. In 1891 the church suffered a division, the culmination of a controversy of several years' duration. Two bodies met, one at Indianapolis and the other at Philadelphia, each claiming to be the true and lawful General Conference and regarding the other as spurious. Lawsuits resulted concerning titles to property, the final decision of which was given in favor of the party representing the majority, whose General Conference had been held at Indianapolis. The minority then withdrew and organized the United Evangelical church. By this division the Evangelical Association lost about 40,000 members. In 1891, previous to the division, it had 26 annual conferences, 1227 itinerant and 619 local preachers, 150,334 church members, church buildings valued at $5,168,210, and a missionary income for the preceding year of $159,443. In 1913 it had 26 annual conferences, including two in Germany and one in Switzerland; 1644 churches, 111,702 communicants, about 190,000 pupils in Sunday schools, church property valued at about $10,500,000, and a total income for missions of about $1,000,000. Besides its German elements, it has a relatively large English-speaking membership and publishes English periodicals and English books. It has four bishops, a well-equipped publishing house at Cleveland, and another at Stuttgart, Württemberg; a biblical institute and Northwestern College at Naperville, Ill.; two seminaries; an orphan home at Flat Rock, Ohio; a charitable society; a missionary society, sustaining domestic missions and foreign missions in Japan and China, and assisting the European churches; a Woman's Missionary Society; a Church Extension Society; a Sunday-School and Tract Union; and a Young People's Alliance. Hospitals are maintained in various cities in Germany and in Chicago, and in Bismarck, N. Dak. Its periodicals are: *The Evangelical Messenger* (weekly); *The Missionary Messenger* (monthly); *Der Christliche Botschafter* (weekly); *Der Evangelische Missionsbote* (monthly); papers for Sunday schools and the young people, in English and German—all published at Cleveland; *Der Evangelische Botschafter* (weekly); and *Der Evangelische Kinderfreund* (weekly), published at Stuttgart, Württemberg. Consult: Plitt, *Die Albrechtsleute* (Erlangen, 1877); W. Orwig, *History of the Evangelical Association* (Cleveland, 1858); Mrs. H. Bennett, *History of the Woman's Missionary Society of the Evangelical Association* (ib., 1902); Carroll, *Religious Forces of the United States* (rev. ed., New York, 1912).

EVANGELICAL BODY. See CORPUS CATHOLICORUM.

EVANGELICAL CHURCH CONFERENCE (Ger. *Evangelische Kirchenkonferenz*). See EISENACH CHURCH CONFERENCE.

EVANGELICAL CHURCH, THE UNITED. See UNITED EVANGELICAL CHURCH.

EVANGELICAL COUNSELS, or COUNSELS

OF PERFECTION. A term signifying, among Roman Catholics, the recommendation of certain things which are not universally necessary to salvation, but which those who wish to attain perfection are advised to practice. The most important are those which form the basis of the monastic vows of poverty, chastity, and obedience. A basis is found for them in certain words of Christ, as Matt. xix. 16 ff.

EVANGELICAL UNION. The name assumed by a religious body constituted in Scotland in 1843 by the Rev. James Morison (q.v.), of Kilmarnock, and three other ministers, who had been separated from the United Secession church for doctrinal views, of which the fundamental and determining article was the strict universality of the Saviour's atonement. They were soon joined by a number of ministers and churches of the Congregational Union of Scotland and extended themselves considerably in Scotland and the north of England, having 93 churches in 1889. In 1896 nearly all the churches were absorbed by the Congregational Union. Their church government is independent, but many congregations have ruling elders. Consult Ferguson, *The History of the Evangelical Union* (Glasgow, 1876), and Adamson, *Life of Dr. James Morison* (London, 1898).

EVAN'GELINE. An exquisite idyllic poem by Longfellow, deriving its title from its heroine and published in 1847. It is the story of two lovers, Gabriel and Evangeline, who are parted during the deportation of the Acadians by the British in 1755. The lovers vainly seek each other, but are brought together only at Gabriel's deathbed, after many years.

EVAN'GELIST (Gk. εὐαγγελιστής, *euangelistēs*, bringer of good tidings [the gospel], from εὐαγγελίζεσθαι, *euangelizesthai*, to preach good tidings [the gospel], from εὐαγγέλιον, *euangelion*, good tidings [the gospel]). A term which occurs three times in the New Testament, but is not found in either classical or LXX Greek and has not as yet been discovered in the Papyri. It designates one of the several phases of ministry referred to in Eph. iv. 11 and is associated with the name of one of the workers in the apostolic church (Philip, Acts xxi. 8) and with one of the helpers of the Apostle Paul (Timothy, 2 Tim. iv. 5). The service which it represented was of a missionary character, itinerant rather than local, pioneer rather than supplemental, its purpose being to carry the gospel message to new parts, preparing the way with aggressive work for the more settled and organizing service which should follow, though not necessarily without a local centre for work, as Philip had in Cæsarea and Timothy in Ephesus. Its missionary work was much more restricted than that of the Apostles: in fact, the mention of evangelists in the Ephesian encyclical letter is doubtless because the churches to which it was sent had been established largely, if not wholly, by means of their missionary work, under the direction of the Apostle Paul (cf. Col. ii. 1; iv. 12 f.; Acts xix. 10).

As to whether it represents a distinctive office or merely denotes a peculiar set of functions, there may be discussion. It should be recalled, however, that the original office of the Apostle was one that embraced in itself all the functions necessary for the primitive life of the Church, and that, as the Church grew in the complexity of its life, the Apostles were compelled to delegate to others duties which they themselves had performed (e.g., Acts vi. 1–4; xiv. 23). It would seem, therefore, that however functional the work of the evangelist may have been at the beginning, the tendency would be, even in the apostolic church, for this work to become confined to men who were best qualified to carry it on and who would thus give themselves wholly to its duties. This would explain the designation of Philip as "the evangelist"; while the exhortation to Timothy to "do the work of an evangelist" would indicate that in his peculiar relations to the Ephesian field he was, as the representative of the Apostle, to assume the office of the evangelist as well as that of the pastor and the teacher. In the earlier established churches the apostolic representatives embraced in their work functions which were later assigned to distinctive sets of workers. (Cf. 1 Thess. v. 12 with Eph. iv. 11 and Phil. i. 1.)

In postapostolic times the work of the evangelist underwent a radical change, losing its missionary character and even its itinerant form. Before this change took place, however, the term began to be used of those who had transmitted in writing the oral message of the good tidings of salvation; so that, as these writings came to be termed evangels (gospels), their writers came to be termed evangelists. This meaning first appeared in the third century and later came to be the distinctive usage of the term. In later liturgical language the term was used to denote the reader of the gospel for the day. Its present reference is, somewhat in its earlier sense, to a preacher of the gospel whose work is given specifically to awakening personal interest in religion and who is not permanently connected with any local field, nor devoted to the usual service of the pastorate. Consult: Zöckler, "Diakonen und Evangelisten," in *Biblische und Kirchenhistorische Studien* (München, 1893); Reville, *Les origines de l'épiscopat* (Paris, 1895); Zahn, *Missionsmethoden im Zeitalter der Apostel* (Erlangen, 1886); Harnack, *The Expansion of Christianity in the First Three Centuries* (2d ed., 2 vols., London, 1908); *The Constitution and Law of the Church in the First Two Centuries* (ib., 1910).

EVAN'GELISTA'RION (ML., from MGk. εὐαγγελιστάριον, book of selections from the Gospels, from Gk. εὐαγγέλιον, *euangelion*, gospel). A lectionary or service book of the Greek church, containing the lessons taken from the Gospels for each day in the year. The custom of assigning to each day some portion or portions of Scripture as its appropriate reading was in vogue very early in the Eastern church. In process of time usage in this respect became quite uniform, each day of the year having its special lesson from the Gospels and another from the Epistles or Acts. In addition to these regular daily readings, holy and saints' days had their own appropriate readings assigned. It was customary to mark, in red ink, in the text of New Testament manuscripts, where the appointed lessons began or ended, by the words or abbreviations ἀρχή or ἀρχ (= beginning) and τέλος or τελ (= end), while on the margin or at the bottom of the page the day to which the lesson belonged was indicated. But more convenient for use were the books, often called lesson or service books, containing collections of the readings arranged in chronological order. If such a book included only Gospel lessons, it was called an Evangelistarion: if the lessons were those from the Acts and Epistles, the book was called a Praxapostolos. If the book included both, it was a Euchologia, or Book of Offices. Lists or tables of such readings were also in circulation, called Synaxaria. If a table was of the daily readings only, it was called an Eclogadion; if of the readings for saints' days only, it was called a Menology. Hundreds of manuscripts of Evangelistaria are in existence, some of them quite sumptuous. They date from the sixth century onward, and many are of considerable value for the textual criticism of the New Testament. Consult Scrivener, *Introduction to the Textual Criticism of the New Testament* (4th ed., London, 1894), and C. R. Gregory, *The Canon and Text of the New Testament*, pp. 384–393 (New York, 1907). See Lectionary.

EVAN'GELISTS, Symbols of the Four. The symbolism by which the four Evangelists are represented by certain living figures had its origin with Irenæus and is founded on the passage in the Book of Revelation (iv. 64) which describes the four living creatures before the throne of God. It secured wide currency in the Church, though there was little or no agreement as to the order in which the creatures were assigned to the separate Evangelists. The order which is best known and is most largely represented in Christian art is that which prevailed throughout the Western church from the time of Jerome. In this Matthew is represented by a man, Mark by a lion, Luke by a calf, and John by an eagle. The earliest symbol used to typify the Evangelists as a class was four scrolls, or four books, placed in the four angles of a Greek cross. Later the symbol of four rivers was used. The conventional symbols referred to above came into use in the fifth century. Consult Mrs. Henry Jenner, *Christian Symbolism* (Chicago, 1910); and Elizabeth E. Goldsmith, *Sacred Symbols in Art* (New York, 1911).

EVANS, Alexander William (1868–). An American botanist, born at Buffalo, N. Y. He was educated at Yale University (Ph.B., 1890; M.D., 1892; Ph.D., 1899), and at Munich and Berlin. After 1895 he taught botany at Yale, in 1906 becoming Eaton professor at Sheffield Scientific School. In 1911 he was president of the Botanical Society of America. His investigations cover the Hepaticæ of Alaska and Japan, and the bryophytes of Connecticut.

EVANS, Sir Arthur John (1851–). An English archæologist, born in Nash Mills, Herts, the son of the antiquary Sir John Evans. He was educated at Harrow, at Brasenose College, Oxford, and at Göttingen, and for 10 years after 1873 traveled in eastern Europe, especially the Balkans, publishing *Illyrian Letters* (1878), and being imprisoned in 1882 charged with conspiracy in southern Dalmatia. In 1884–1908 he was keeper of the Ashmolean Museum, Oxford. In 1893 he undertook investigations in Crete (q.v.) of the utmost archæological and historical importance, particularly in the discovery of what he considered to be a pre-Phœnician script (see Archæology, *Minoan or Ægean Period*). Among his works are: *Through Bosnia* (1895); *Cretan Pictographs and Præ-Phœnician Script* (1896); *Further Discoveries of Cretan and Ægean Script* (1898); *Scripta Minoa* (1909). He was knighted in 1911. In 1878 he married a daughter (died 1893) of E. A. Freeman, the historian, the fourth volume of whose *Sicily* he published with revisions and additions.

EVANS, Augusta Jane (1835–1909). An American author. She was born near Columbus, Ga., but when a child removed with her father to San Antonio, Tex., which the family left after two years (1847–49) to settle in Mobile, Ala. She was married to L. N. Wilson in 1868. Her works consist of a number of novels, popular in their time, such as *Inez: A Tale of the Alamo* (1856); *Beulah* (1859); *Saint Elmo* (1866); *Vashti* (1869); *At the Mercy of Tiberius* (1887); *A Speckled Bird* (1902).

EVANS, Christmas (1766–1838). A Welsh Baptist preacher. He was born at Isgaerwen, Cardiganshire, on Dec. 25, 1766. He was brought up among Presbyterians, but became a Baptist in 1788 and was ordained as a missionary among the Baptists in Carnarvonshire (1789). In 1792 he removed to Anglesey, and till 1826 lived there, and virtually exercised episcopal functions over his brethren. His arbitrary and dictatorial conduct was offensive and compelled his removal to Glamorganshire in 1826. In 1828 he went to Cardiff, and in 1832 to Carnarvon. He was familiar to all Welshmen by reason of his journeys over the principality in behalf of church building, and famous for his eloquence. He died at Swansea, July 19, 1838. For his biography, consult Hood (London, 1881).

EVANS, Edward Payson (1831–1917). An American author and scholar. He was born at Remsen, N. Y., moved to Michigan in 1850, and was educated at the University of Michigan (A.B., 1854; A.M., 1857), where, after several years of teaching in Mississippi and Wisconsin, he was professor of modern languages and literatures in 1862–67. After 1870 he resided in Europe, and after 1884 he was on the staff of the *Allgemeine Zeitung* of Munich. He also became known as a contributor to German and American reviews and periodicals. His publications include: Adolf Stahr's *Life and Works of Gotthold Ephraim Lessing* (1866); Athanese Coquerel, Jr.'s *First Historical Transformation of Christianity* (1867); *Abriss der deutschen Litteraturgeschichte* (1869); *A Progressive German Reader* (1870); *Animal Symbolism in Ecclesiastical Architecture* (1896); *Evolutional Ethics and Animal Psychology* (1897; 2d ed., 1898); *Beiträge zur Amerikanischen Litteratur und Kulturgeschichte* (2 vols., 1898–1903); *The Criminal Prosecution and Capital Punishment of Animals* (1906).

EVANS, Edward Radcliffe Garth Russell (1881–). A British explorer, educated at Merchant Taylors' School. Entering the British navy in 1897, he became sublieutenant in 1900, lieutenant in 1902, and commander in 1912. In 1902–04 he served on the *Morning*, sent in relief of the Discovery expedition. In 1909 he joined the British Antarctic expedition as second in command, and after Captain Scott and several of his companions had perished on an advance expedition, late in December, 1912, Evans returned in command of the expedition. (See Polar Research.) In 1914 he lectured in the United States on the Scott expedition. He was awarded the Shadwell testimonial prize in 1907 and the cross of the Legion of Honor in 1914, and was created C.B. in 1913.

EVANS, Evan Heber (1836–96). A Welsh Congregational clergyman, born near Newcastle, Emlyn, Cardiganshire. Educated at the Normal College, Swansea, and the Memorial College, Brecon, he served as pastor of Lebanus Church, Morriston (1862–65), and of Salem Church, Carnavon (1865–94), becoming especially celebrated as an eloquent pulpit orator. He filled the chair of the Welsh Congregational Union in 1886 and of the Congregational Union of England and Wales in 1892 and in 1894 became principal of the Congregational College at Bangor. He also edited the Welsh Congregational magazine, *Y Dysgedydd.* Consult his *Life* by H. Elvet Lewis.

EVANS, Frederick William (1808–93). An American reformer. He was born in England, but came to the United States in 1820, was apprenticed to a hatter and, in the intervals of his work, studied the writings of Owen, Fourier, and other social reformers, and became a thoroughgoing Socialist. After visiting the Shakers at Mount Lebanon, N. Y., he determined to join them and soon became an elder and a recognized leader. By his teachings he modified the doctrines of the sect. Among his writings are: *Autobiography of a Shaker* (1869; new ed., 1888); *Shaker Communism* (1872); *The Second Appearing of Christ* (1873).

EVANS, Sir George De Lacy (1787–1870). A British soldier and politician. He was born in Limerick, Ireland, entered the British army in 1806, was present, as lieutenant colonel of infantry, at the capture of Washington, the attack on Baltimore, and the operations before New Orleans, in the War of 1812, and fought under Wellington at Waterloo. He served in Parliament in 1831–32 and from 1833 to 1841 and again from 1846 to 1865, as a representative of the "Advanced Liberals," and in 1835 commanded the British Auxiliary Legion in Spain. In 1854 he was promoted lieutenant general and was selected to command the second division of the army in the Crimea, where he distinguished himself at Alma and Inkerman. He was promoted general in 1861.

EVANS, Henry Clay (1843–1921). An American Republican politician, born in Juniata Co., Pa. In 1864 he enlisted in the Forty-first Wisconsin Infantry, subsequently established manufactories of iron and railway cars at Chattanooga, Tenn., and was twice elected mayor of that city. From 1889 to 1891 he was a member of Congress and from 1889 to 1893 Assistant Postmaster-General. In 1894 he was elected Governor of Tennessee in accordance with the original returns, but on a recount by the Legislature certain returns were thrown out as irregular, and the Democratic candidate, Peter Turney, was declared elected. At the Republican National Convention of 1896 he was second in the balloting for Vice President. He was United States Commissioner of Pensions in 1894–1902, and Consul General at London from 1902 till 1905. In 1911, when the city of Chattanooga adopted a commission form of government, he became commissioner of education and health.

EVANS, Hugh Davey (1792–1868). An American author. He was born in Baltimore, was admitted to the Baltimore bar in 1815, and attained eminence as a constitutional lawyer. He was prominent in the councils of the Protestant Episcopal church, edited several religious newspapers between 1843 and 1858, and from 1852 to 1864 was lecturer on civil and ecclesiastical law in St. James's College, Maryland. The most important of his publications is his *Treatise on the Christian Doctrine of Marriage*, published posthumously in 1870. Consult Harrison, *Memoir of Hugh Davey Evans* (Hartford, 1870).

EVANS, Sir John (1823–1907). An English antiquary. He was born in Market Bosworth, Leicestershire, and was educated by his father. He made a fortune in paper manufacture and thereafter devoted himself largely to collecting coins and antiquities. His researches embrace the departments of geology, archæology, and numismatics, and his collection of coins ranks among the first in England. He was president of the Geological Society (1874–76), the Numismatic Society (1875–1902), the Society of Antiquaries (1885–92), the British Association (1897–98), and the Egyptian Exploration Fund. His principal publications include *Coins of the Ancient Britons* (1864; supplement, 1890) and *The Ancient Stone Implements, Weapons, and Ornaments of Great Britain* (1872; 2d ed., 1897), both of which have been translated into French.

EVANS, John Gwenogvryn (1852–). A Welsh scholar, born in Ffynon Velved, Carmarthenshire, and educated at the Presbyterian College of Carmarthen, at Owens College, and at Oxford, where he received an honorary M.A. in 1887 and Litt.D. in 1903. He was editor of the *Series of Old Welsh Texts* and, in 1894–1906, inspector of Welsh documents for the Historical Manuscripts Commission. He published valuable reports on Welsh manuscripts, and the *Red Book Mabinogion* (1887), the first edition of the *White Book Mabinogion* (1907), *Facsimile and Text of Book of Aneirin* (1908), *Facsimile of Chirk Codex of Welsh Laws* (1909), *Facsimile and Text of Book of Taliessin* (1910), and *Amlyn and Amic* (1912).

EVANS, Margaret J. (1842–). An American educator and club woman, born at Utica, N. Y. She graduated from Lawrence University in 1869 (A.M., 1872) and also studied in Paris, Berlin, Heidelberg, and Oxford. From 1874 to 1908 she was professor of English literature and dean of the woman's department of Carleton College. She served as president of the Minnesota Congregational Woman's Board of Missions after 1879 and of the Minnesota Federation of Women's Clubs in 1895–99, as chairman of the Minnesota State Public Library Commission, as the first woman corporate member of the American Board of Commissioners for Foreign Missions (Congregational), and as second vice president (1900–02) and honorary vice president for life (after 1908) of the General Federation of Women's Clubs. She is author of *Woman as Citizen* and also of several published addresses.

EVANS, Mary Ann or Marian (1819–80). An English novelist, the author of *Adam Bede, Felix Holt, Middlemarch, Daniel Deronda, etc.* She wrote under the pseudonym George Eliot, and under this title her life and works are described. See Eliot, George.

EVANS, Oliver (1755–1819). An American inventor. He was born at Newport, Del., and in his early youth was apprenticed to a wheelwright, thus being afforded an opportunity of displaying uncommon inventive genius. When 22 years of age, he invented a machine for making the wire card teeth used in carding cotton and wool, which hitherto had been produced by handwork. He later invented improved machinery for flour mills, which enabled the miller to make not only finer flour, but 20 pounds more to the barrel, at the same time cutting down the cost of labor one-half. Having invented a steam engine, in 1786 he asked for a patent from the Legislature of Pennsylvania for its application to mill machinery and to the steam carriage. Evans made the first high-pressure steam engine and the first steam dredging machine used in the United States. This dredge, weighing about 4000 pounds, was put on wheels and propelled itself to the Schuylkill River, 1½ miles distant, where it was connected to a stern paddle wheel and navigated the Schuylkill down to its junction with the Delaware. This is supposed to have been the first actual propulsion of a carriage on land by steam in America. He designed and constructed an engine for a steam vessel on the Mississippi River, but the boat in which it was to be mounted was never completed, and the engine was installed in a saw mill, where it ran most successfully. He built many steam engines and invented much new machinery and has been termed the "Watt of America." He died in New York, April 21, 1819. Consult Thurston, *Growth of the Steam Engine* (New York, 1878).

EVANS, ROBLEY DUNGLISON (1846–1912). An American naval officer, born in Floyd Co., Va. He graduated at the United States Naval Academy in 1863, served in the West Indies, and participated, with the North Atlantic blockading squadron, in both attacks on Fort Fisher, and in the second was severely wounded. In 1866, however, he returned to the service as a lieutenant. He was lighthouse inspector (1882–86), in 1891–92 commanded the *Yorktown* at Valparaiso, Chile, where American sailors were killed by a Chilean mob (and where Evans gained the sobriquet of "Fighting Bob"); policed the Bering Sea sealing grounds with much vigilance; was made captain in 1893, and in 1896 was transferred to the *Indiana*, the first battleship commissioned by the United States. Later, he was attached to the Lighthouse Board (1897), and during the war with Spain commanded the *Iowa*, taking a prominent part in the battle of Santiago, where the fire of the entire Spanish fleet was at one time concentrated on his ship. In 1898, at his own request, Evans was detached from the *Iowa* and afterward was made a member of the Board of Inspection and Survey. He was advanced to the rank of rear admiral Feb. 11, 1901. It was on Evans's recommendation that steel was first used for American battleships. He was escort to Prince Henry of Prussia, during the latter's visit to the United States in 1902, and in 1904 commanded the fleet in the Far East. In December, 1907, he took command of the fleet which left Hampton Roads for a cruise around the world; but after rounding Cape Horn, and reaching San Francisco, Evans was forced by ill health to give up the command. In 1908 he was retired, with the thanks of the Navy Department. He published two volumes of reminiscences, *A Sailor's Log* (1901) and *An Admiral's Log* (1910).

EV'ANSTON. A city in Cook Co., Ill., 12 miles north of Chicago, of which it is a popular suburb, on Lake Michigan, and on the Chicago and Northwestern and the Chicago, Milwaukee, and St. Paul railroads (Map: Illinois, J 1). It is beautifully situated on the lake and contains the Northwestern University (q.v.), the Garrett Biblical Institute, and a public library. It is the national headquarters of the Women's Christian Temperance Union. Settled about 1835, Evanston was incorporated about 1890. Its government is administered by a mayor, elected biennially, and a unicameral city council. With the exception of the city treasurer and city clerk, who are chosen by popular election, all municipal officials are nominated by the mayor, with the consent of the council. The city owns and operates its water works. Pop., 1900, 19,259; 1910, 24,978; 1914 (U. S. est.), 27,724; 1920, 37,215.

EVANSTON. A town and the county seat of Uinta Co., Wyo., 90 miles west-southwest of Rock Springs, on the Bear River, and on the Union Pacific Railroad (Map: Wyoming, A 4). It is the seat of the State Institution for the Insane and contains a fine courthouse and public library. The city is in an agricultural, stock-raising, and coal-mining district and has oil fields, large ice plants, and railroad repair shops. The water works are owned by the town. Pop., 1900, 2110; 1910, 2583.

EV'ANSVILLE. A city, port of entry, and the county seat of Vanderburg Co., Ind., about 150 miles (direct) west-southwest of Indianapolis, on the Ohio River, and on the Chicago and Eastern Illinois, Cleveland, Cincinnati, Chicago and St. Paul, the Southern, the Louisville and Nashville, and the Illinois Central railroads (Map: Indiana, B 9). Among the more prominent buildings are the customhouse, courthouse, city hall, United States Marine Hospital, State Hospital for the Insane, Elks' Home, St. Mary's and Deaconess hospitals, Carnegie libraries, high school, Little Sisters' Home for the Aged, and Willard Library. Other features of interest are Cooks, Mesker, Sunset, and Garvin parks. Coal abounds in the vicinity, and the city has a large trade in coal, timber, grain, pork, tobacco, and flour. Abundant water power is supplied by a large government dam, erected on the Ohio River, near here, at a cost of $2,000,000. The industrial plants include foundries and machine shops, breweries, flouring mills, furniture factories, plow works, and establishments for the manufacture of cotton and woolen goods, leather, glass, stoves, steam shovels, gas engines, cigars, buggies and wagons, wire fence, metal beds, etc. The government is administered by a mayor, elected every four years, and a city council, seven of the members of which are elected by wards and three at large. All other officials, excepting the clerk and the police judge, who are elected, are appointed by the executive. The receipts of the city in 1912 were $3,479,000, and its payments the same amount, the chief items being: education, $282,000; police, $83,900; fire, $95,200; and water works and filtration plant (owned by the city), $80,700. Evansville was founded in 1816 by Gen. Robert M. Evans, became the county seat in 1819, and with a population of 4000 was incorporated as a city in 1847. It was reincorporated in 1905. Pop., 1890, 50,750; 1900, 59,007; 1910, 69,647; 1914 (U. S. est.), 71,284; 1920, 85,264.

EVAP'ORA'TION (Lat. *evaporatio*, from *evaporare*, to evaporate, from *e*, away + *vaporare*, to emit vapor, from *vapor*, vapor), or VAPORIZATION. The change of state from solid or liquid to gaseous. All substances emit vapors, and those which at ordinary temperatures evaporate rapidly are said to be volatile. If the vessel in which a liquid is allowed to evaporate be open, the vapor will diffuse through the air, and evaporation will go on until there is no more liquid left. But if a liquid is placed in an air-tight vessel, evaporation goes on until the vapor escaping from the liquid has attained a certain definite pressure within the vessel, and then a "dynamic" equilibrium is established; i.e., evaporation will not really cease, but the amount of vapor condensed in a given time becomes exactly equal to the amount of liquid vaporized in the same time, and hence, as a net result, no further change can be observed. At any rate, whether this conception of the equilibrium attained is correct or not, the vapor from a single liquid attains, within a closed vessel, a certain maximum of pressure, which is determined *almost* entirely by the nature of the liquid and its temperature. Dissolving a foreign substance in a liquid always *diminishes* the vapor pressure of the liquid. Mechanical compression of the liquid by means, say, of an insoluble gas always *raises* the vapor pressure of the liquid, because such compression causes the liquid to occupy a smaller space. On the other hand, if the surface of a liquid is curved, as it is in a capillary tube, the vapor pressure of the liquid is considerably *diminished.* At the same temperature different liquids have different vapor tensions, and when the temperature is raised, the vapor tension of each is increased by an amount depending, again, upon the nature of the liquid. When the vapor of a substance has attained its full pressure, it is said to be *saturated.* The full vapor tension corresponding to a certain temperature is not attained instantaneously, since evaporation requires *time.* The rate of evaporation depends on a large number of circumstances, some of which are more or less accidental, i.e., have nothing to do with the nature of the liquid experimented upon. Thus, the size, shape, and material of the vessel in which evaporation is allowed to take place have a considerable influence on the rate. Other factors are the temperature of the liquid itself, the density of the atmosphere above its surface, and the magnitude of the surface exposed, shallow vessels being employed when rapid and copious evaporation is required. In case the liquid is a mixture or a solution, the rate of evaporation depends greatly upon its composition and upon the nature of the several constituents.

The Heat of Evaporation. The temperature of pure boiling water remains constant; yet heat must be continually supplied to it in order that evaporation may go on; the heat does not appear as sensible heat, but is required to produce the change of state. The heat required to convert one gram of a substance into vapor is called its *heat of evaporation.* The laws of thermodynamics lead to methods that permit of calculating the heat of evaporation of a substance if certain other numerical data in connection with the substance are known. Thus, if the volume occupied by one gram of a liquid is V′, and the volume occupied by one gram of its saturated vapor is V, the "absolute temperature" being T (by the absolute temperature is meant the ordinary centigrade temperature increased by 273), and if the increase in the vapor pressure produced by a rise of 1° in temperature is denoted by the symbol $\frac{dp}{dT}$, then the heat of evaporation, l, may, according to Clausius, be calculated by the following formula:

$$l = T\frac{dp}{dT}(V - V').$$

At the critical temperature (see CRITICAL POINT) there is no difference between a liquid and its vapor; the difference between the volumes occupied by one gram of liquid and one gram of vapor is naught, and the heat of evaporation is likewise naught, as is shown by the above formula.

Cooling by Evaporation. Since the transformation of liquids into vapors involves the absorption of heat, a liquid may be cooled by allowing it to evaporate without supplying heat to it from any outside source; the evaporation will then take place at the expense of the sensible heat of the liquid itself, and as a result the temperature will be lowered. Thus, the rapid evaporation of liquid ammonia or of sulphurous acid produces temperatures low enough for water to freeze and is employed in making artificial ice. Liquid ethylene evaporates rapidly and produces temperatures low enough for compressed air to be liquefied; the evaporation of the air thus liquefied produces still lower temperatures, and in this manner the most refractory gases, including helium and hydrogen, have been liquefied. When liquefied carbonic acid is forced, by the pressure of its own vapor, in a fine stream into the air, it evaporates so rapidly that a portion of the stream is frozen.

Evaporation is continually going on in nature on a gigantic scale. Vapor from the ocean is continually rising into the atmosphere, it then condenses into mists or clouds and, under certain conditions not as yet fully understood, falls as rain, hail, or snow, to be again evaporated from the ground, or from rivers, lakes, and seas.

A very useful annotated bibliography of evaporation by G. J. Livingston was published in the *Monthly Weather Review* (Washington, June, 1908, to June, 1909). Important papers on evaporation in the United States will be found in the *Monthly Weather Review* (Washington, 1886, vol. xiv, p. 299; 1888, vol. xvi, pp. 235–239, map; and 1907, vol. xxxv, to 1910, vol. xxxviii). A summary of our knowledge of the subject will be found in the same journal for March, 1914. Consult Hausbrand, *Verdampfen, Kondensieren, und Kühlen* (5th ed., Berlin, 1912). See BOILING POINT; VAPOR.

EVAP'OROM'ETER. See ATMOMETER.

EV'ARTS, JEREMIAH (1781–1831). An American editor. He was born at Sunderland, Vt., graduated at Yale in 1802, and practiced law in New Haven. From 1810 to 1820 he was editor of the *Panoplist*, and in 1820, when the *Missionary Herald* was issued in its stead, he took charge of that periodical. In 1821 he was chosen corresponding secretary of the American Board of Commissioners for Foreign Missions. He was an efficient organizer of Christian missions and took an active part in the movement to secure justice for the Indian tribes. Consult Tracy, *Memoirs of Jeremiah Evarts* (Boston, 1845).

EVARTS, WILLIAM MAXWELL (1818–1901). An eminent American lawyer and statesman. He studied at the Harvard Law School until 1839. In 1841 he was admitted to the bar. He was deputy United States district attorney from 1849 until 1851 and district attorney from 1851 until 1853. In 1860 he attended the National Republican Convention in Chicago as the chairman of the New York delegation and nominated Seward for the presidency. During the Civil War he was secretary of the Union Defense Committee and was sent by President Lincoln on a diplomatic mission to England. He was the senior counsel of President Johnson in the great impeachment trial of 1868 (see JOHNSON, ANDREW) and did much to secure his acquittal. From July, 1868, until March 4, 1869, he was Attorney-General of the United States. In 1872 he acted as chief counsel of the United States before the Geneva Court of Arbitration. In the contest between Hayes and Tilden in 1877 for the succession to the presidency, Evarts was the leading counsel of the Republicans before the Electoral Commission (q.v.). He was appointed Secretary of State by President Hayes and served throughout the term. In 1881 he was sent as a delegate of the United States to the International Monetary Conference at Paris, and from 1885 to 1891 he served in the United States Senate. He then retired both from politics and from the bar. Among his public addresses are the eulogy on Chief Justice Chase, delivered at Dartmouth in 1873; the Centennial oration delivered in Philadelphia in 1876; and his orations at the unveiling of statues in New York to William Seward and Daniel Webster.

EVE. The name of the first woman in Gen. iii. 20. Ordinarily she is only spoken of in the narrative as "the woman," but in this passage and in Gen. iv. 1 the proper name occurs. Hebrew folk etymology explains it as "the living one"; she was so called "because she became the mother of all living." Since Hawwah is not the Hebrew word for "living," some scholars regard the name as a late addition, made at a time when Aramaic had become the vernacular; others assume that the original meaning was "serpent," and that a serpentine chthonic divinity was once considered the mother of mankind. It should be said, however, that there is no direct evidence of such a goddess, and that the figure of Eve has not been found in Babylonian mythology. No woman is connected with the story of Adapa (q.v.), and it is still doubtful what the significance is of the representation on a seal of a man and a woman, a tree and a serpent. The first account of creation (Gen. i) does not mention a first woman any more than a first man; like the other living beings, the human race is created en masse, "males and females created he them" (verse 26). According to Gen. ii. 15 ff. Eve was made out of a rib taken from Adam while he was in a deep sleep, after none of the animals fashioned and brought before man to be named had proved to be a helper that might stand before him. In Gen. iii. Eve learns from a wise serpent the virtues of the fruit of a tree in the midst of the garden of Eden, shares the fruit with her husband, and, as predicted by the serpent, they become like gods, so that the deity declares "now that man has become like one of us" (verse 22), they know good and evil, and would live forever, if they were not driven out of the garden. Consult Breymann, *Adam und Eve* (Göttingen, 1893), and Gunkel, *Genesis*, 3d ed. (Berlin, 1912). See Adam.

EVE, Paul Fitzsimmons (1806–77). An American physician. He was born near Augusta, Ga., and graduated at Franklin College (Georgia) in 1826 and at the University of Pennsylvania Medical College in 1828. He then studied in Europe for several years and acted as surgeon in the Polish Revolution of 1831. He was professor of surgery in Georgia Medical College (1832–49), and in the universities of Louisville (1849), Nashville (1850–68), and Missouri (1868–77). In 1857 he was president of the American Medical Association. He published more than 600 articles on medical subjects. His most important publication is *Remarkable Cases in Surgery* (1857).

EVEC'TION (Lat. *evectio*, a carrying upward, from *evehere*, to carry out, from *e*, forth + *vehere*, to carry). The greatest of the lunar perturbations or inequalities. It depends upon the alternate increase and decrease of the eccentricity of the moon's orbit. Evection may change the moon's geocentric longitude by as much as 1° 15′ and alter the time of occurrence of an eclipse by six hours. See Lunar Theory.

EVELETH, ĕv′ĕ-lĕth. A city in St. Louis Co., Minn., 71 miles north by west of Duluth, on the Duluth, Missabe, and Northern, and the Duluth and Iron Range railroads (Map: Minnesota, E 3). It contains a public library and three parks. Eveleth is in a rich iron-mining region and has lumber and dairying interests. The city adopted the commission form of government in 1913. It owns its water works. Pop., 1900, 2752; 1910, 7036.

EV'ELYN, John (1620–1706). An English author and virtuoso, born Oct. 31, 1620, at Wotton, the family seat, Surrey. Educated first at the free school of Lewes, he was afterward for a short time at Balliol College, Oxford, and also studied at the Middle Temple. During the Civil War he found it prudent to pass much of his time on the Continent, though he served in the King's army for three days (1642) and lived in England for two years (September, 1647. to June, 1649). Returning to England in 1652, he settled at Sayes Court, Deptford, where he lived quietly, amusing himself with gardening till the Restoration. A trusted Royalist, he was much employed by the government, though he was given no high office. He was of those who were instrumental in the formation of the Royal Society, in which he was one of the first and most valuable members. In 1694 he removed from Sayes Court to Wotton, where he died, Feb. 27, 1706. Evelyn wrote upon a great variety of subjects—art, architecture, gardening, and commerce. These works, of which there are about 30, have little permanent value. His *Sylva, or a Discourse of Forest Trees* (1664) was long a standard work. His *Sculptura* appeared in 1662, and *A Character of England* in 1659. His *Diary* is the work by which he lives. It covers about 70 years, and these the most dramatic in the history of England. It is of inestimable value. Scott said he had "never seen a mine so rich." The *Diary* was first published in 1818–19. The sixth edition, with *Life* by Wheatley, appeared in London (1879). A good later edition is *Diary and Correspondence* (London, 1906).

EVENING GROSBEAK. See Grosbeak.

EVENING PRIMROSE. See Œnothera.

EVENING SCHOOLS. Schools found in England, the United States, and the leading continental countries of Europe, whose principal object is to provide either elementary or special instruction for those who are unable to attend day schools on account of the necessity of earning a livelihood. They supply three classes of wants: (1) primary instruction, for the illiterate, juvenile or adult; (2) vocational training, commercial or industrial; (3) the desire for some higher, liberal culture on the part of the masses generally, and especially of those who have enjoyed few or no opportunities for advanced instruction in the ordinary schools. The evening school, from being a place for mere primary instruction, has in recent years become more and more either a vocational or a higher-culture school. Such schools are the mechanical institutes, workingmen's colleges, and the continuation schools established by local authorities in England, the Prussian *Fortbildungsschulen*, the various classes of courses for adults, the evening work in the apprentice schools in France, and the evening high schools and such institutions as Cooper Union in the United States.

In Germany the evening schools may be said to have sprung from the old Sunday schools, which in 1760 began to give, in addition to religious instruction, some training in primary work. Late in the eighteenth century cities took up the task of supplementing the somewhat meagre education that some of the poorer children had received, Berlin being the first to found a free school for manual workers. In 1844 the Prussian Cultusminister issued a circular calling attention to the need of such schools, but, although this was immediately followed by considerable activity in the matter, it soon languished. Eventually, however, their number increased, and their position became more definite. They extended the time of instruction to from four to eight hours a week, occupying evenings usually. With the rapid development of industrial and commercial life, and the elaboration of the school system, they turned more and more to giving instruction in technical and commercial matters. Their curriculum, originally confined to German and arithmetic, came to include elementary geometry and drawing, then history, geography, and natural science, with bookkeeping, correspondence, etc. These *Fortbildungsschulen*, or continuation schools, attempt to fit the course of study to the occupations of the school locality. Those in the cities are classified as commercial and industrial, while those in the country emphasize subjects of study relating to agriculture. They are often connected with schools for special trades or occupations, and in fact such schools are classified under continuation schools frequently. Many of them do not carry on their work in the evening. In 1912 the *Fortbildungsschulen*—public and guild—were attended by 473,381 industrial and 56,172 commercial students under compulsory regulations, and 22,729 industrial and 3296 commercial attended voluntarily. The tendency throughout Germany is to make attendance in continuation schools, held more usually in the daytime, compulsory, to relate the work of the schools with the trade of the student, and to provide a general training in citizenship along the lines successfully inaugurated in Munich by Dr. George Kerschensteiner.

Although schools for the education of adults had existed in France as early as 1709, the notion of having evening schools for this purpose seems to have been introduced from England in 1820, when such an institution was established in Paris. After 1830 the movement was extended, and in 1867 there were 35,000 such classes in France. A decline in number followed, but recently they have again been on the increase, numbering, in 1911–12, 52,797 courses for male and female students. The classes for women are generally separate from those for men. The work is (1) for illiterates, or (2) a review and extension of primary work, or (3) preparation for special vocations. There is thus an extensive system of continuation schools—*education postscolaire*—which give vocational courses and award certificates of attendance. Many of these courses are given in the evenings. But, as in England, there is a strong feeling that attendance should be made compulsory for several years after the elementary school age. At present not more than about 600,000 students attend these courses. In 1876 the *Comité d'encouragement des Etudes Commerciales* began the establishment of commercial evening schools, while the Société Polytechnique and the Société Philotechnique, founded in 1830 and 1848 respectively, are now offering evening instruction in commercial branches, industrial and constructive arts, and mathematics. Such private agencies provide about 6000 courses in addition to the number of public courses given above. In addition there is a considerable movement in the direction of university extension courses, which are held in the evening. In general it may be said that the French evening schools do not attend quite so much to liberal and ethical training as do the German continuation schools, but emphasize more specific industrial and commercial work.

In England the first evening school proper for instructing boys and girls who had to work all day for a livelihood was founded in 1806 at Bristol by the Benevolent Evening Schools Society. The first school established exclusively for adults was in Bala, Merionethshire, in 1811, by the Rev. T. Charles. Similar schools were founded in Bristol in 1812 and in London in 1816. In a few years they existed in 30 towns. The government, through the science and art department and the education department, began to grant for their support certain allowances out of the public fund for education. These were, however, very sparing until 1861, when a revision of the code permitted day-school teachers to teach in the evening schools. Aid to teachers was withdrawn, but capitation grants were made on the average attendance and for successful examinations. The result was a great increase in the sums obtained for such schools as were devoted to review work, etc., and as also had paid certificated masters instead of voluntary ones. At the same time the schools devoted to illiterate adults were left largely to the care of private beneficence. This type of school, however, became constantly less and less necessary, while the evening continuation school developed into a more and more elaborate institution. Until 1890 its curriculum was confined to elementary subjects, and no aid was granted to pupils over 21. At that time, however, and especially by the Code of 1893, the course was enlarged, the attendance of persons over 21 recognized, and the method of granting money changed so as to recognize the work of the school as a whole, rather than the attainments of the individual pupil. The schools, as a result, became largely secondary, and their attendance steadily increased. In 1898 the attendance in England and Wales was 435,600 in 5535 schools. In 1900, however, came the Cockerton Judgment, by which it was declared to be illegal to apply the parliamentary grants for other than elementary education or for pupils above 14. This obstacle was removed by the Education Act of 1902, which empowered local education authorities to provide higher education out of the rates. The work which had been done under the science and art department's supervision had not been interfered with. The evening schools as organized at present are in session three or four evenings a week for two hours from September to April. So far as possible students are encouraged to take work by courses rather than isolated subjects, and graduated schemes lasting several sessions have been established. The subjects are grouped in six divisions: I. (*a*) Preparatory and general, including elementary school subjects, civics, and music; (*b*) literary and commercial, including foreign languages, economics, commercial law, etc. II. Art. III. Manual or industrial instruction. IV. Science and mathematics. V. Home occupations and industries for women. VI. Physical training. More attention is being paid to social work and the schools are beginning to be centres for numerous social activities. An interesting scheme was introduced in London in September, 1913, to provide a coördinated system of evening instruction in commercial, technical, art, domestic, women's trades, and nonvocational subjects to be taught by full-time or half-time teachers. In 1911–12 the Board of Education recognized 7749 centres for evening education attended during the year by 722,776 students, of whom 606,580 earned the grant. Statistics hardly indicate the success or otherwise of the evening schools, which can only be measured by the persistence of attendance; for while enrollment figures may be high at the beginning of the year, there is a sad falling off towards the end. It is felt very generally that England must introduce compulsory attendance up to the age of 17 or 18.

In the United States evening schools were established at first largely to provide for children in the great cities who were occupied during the day. Attendance at them has been confined principally to older children and adults. They were tried in New York City in 1834, but failed for want of teachers. Fourteen years later the Public School Society successfully reëstablished them. Within two years they had 15 schools and 8000 pupils. The Boston evening schools were legally recognized in 1857. In 1911–12 there were evening schools in 204 cities having 10,000 inhabitants or more. They were situated in 34 States, although 41 were in Massachusetts. The attendance was made up largely of pupils who did not attend day classes. In most cities the schools were kept open only a few months, and the work was inferior and inadequate. As a result the attendance did not increase rapidly, or even declined. The establishment of evening high schools, which emphasize commercial and technical work, has come to remedy this situation, and the United States finds, as other countries have found, that secondary evening instruction is more in demand and more effective than that of the primary grade. In 1884 five large cities had evening high schools, and since then their number has steadily increased, until in 1911–12 there were such high schools in 81 cities with a population of 10,000 and over, enrolling 134,818 pupils and having an average attendance of 46,575. The tendency generally is to provide evening schools in which those already engaged in some wage-earning occupation can improve themselves in their trade and along general lines. Thus, by law of 1911 Massachusetts has provided for the establishment of extension courses with related work for men and women, and preparatory courses for women as well as courses in home making to be given in the evening as part of the State-wide provision of vocational education. In addition a variety of means has come into existence by which liberal and vocational instruction is given to people whose time is occupied during the day. Among the most notable are Maryland Institute, Baltimore, and Cooper Union, New York. The latter institution was incorporated in 1857. It furnishes advanced instruction in mathematics and the natural sciences, with applications to the various trades. There is a school of art also, in which attention is paid to the more mechanical of the fine arts, such as engraving, etc. The Young Men's Christian Associations also have established in some cities extensive lines of instruction, carried on mostly in the evening. Much of the university settlement, university extension work, and public-lecture systems also occupy evening hours, and with them the account of the principal lines of evening instruction in the United States may be concluded.

The evening school exists also in European countries other than those already mentioned, as in Holland, Italy, and Switzerland. These nations have been called upon to deal with the same problems which have characterized the development of this school everywhere, and in solving which it has turned more and more towards vocational instruction and liberal studies in advance of the primary grade. Consult: Balfour, *The Educational Systems of Great Britain and Ireland* (Oxford, 1912); Teegan, *Technical and Industrial Education in France* (London, 1892); *Reports of United States Commissioner of Education*, passim; A. J. Jones, *Continuation Schools in the United States* (Washington, 1907); M. E. Sadler, *Continuation Schools in England and elsewhere* (Manchester, 1906); O. Pache, *Handbuch des deutschen Fortbildungswesens* (Wittenberg, 1902). See NATIONAL EDUCATION, SYSTEMS OF.

EVENTOG'NATHI. See PLECTOSPONDYLI.

EVERDINGEN, ā'vĕr-dĭng-en, ALLART, or ALDERT VAN (1621–75). A Dutch landscape and marine painter and engraver. He was born at Alkmaar and, according to a well-founded tradition, studied under Roelandt Savery at Utrecht and Pieter Molyn at Haarlem, where he chiefly resided until his removal to Amsterdam in 1657. In 1640–44 he visited Sweden and Norway, and his subsequent landscapes show the impression made on him by northern scenery. His pictures usually represent waterfalls with fir trees and rocks. His treatment is fresh, spirited, and truthful, his composition masterly, and his atmospheric effects excellent. The color in his landscapes is at times dark, but in his better works it is clear and warm. Hardly less notable are his rarer marines, of which the best is "A Snow-Storm on the Zuyder Zee," in the Musée Condé, Chantilly. The finest collections of his paintings are in Dresden, Munich, Amsterdam, and Copenhagen galleries and in the Louvre. At his best he equals Ruysdael, to whom his works are frequently attributed, although he is usually less versatile in execution and less profound in feeling. He left more than 160 known etchings of great variety and spirit. Fifty-seven of these illustrate the poem of *Reineke Fuchs*. The original drawings for this work, and also others by him, are in the British Museum. Consult Drugulin, *Allart van Everdingen, catalogue raisonné de toutes les estampes qui forment son œuvre gravé* (Leipzig, 1873), and Granberg, *Allart van Everdingen et ses paysages norvegiens* (Stockholm, 1902).

EV'EREST, MOUNT. A mountain of the Himalaya system on the frontier of Nepal and Tibet, situated in lat. 27° 59′ N. and long. 86° 55′ E. (Map: India, F 3). It is the highest known mountain peak on the earth, being about 29,000 feet above sea level, or approximately

5½ English miles. It was named after Sir George Everest, a former surveyor-general of India. It has been much confused with Gaurisankar, which peak is more than 5000 feet lower.

EVEREST, Sir George (1790–1866). An English military engineer, born in Wales. He studied in the Royal Military Academy at Woolwich, England, became a second lieutenant in the Bengal artillery, and participated in a survey of Java and in engineering work on the Ganges. In 1818 he became assistant to Colonel Lambton in the trigonometrical survey of India, and on the chief's death in 1823 became his successor. In 1830 he became surveyor-general of India, and he discharged the duties of both offices until his retirement in 1843. He became a fellow of the Royal Society, was knighted in 1861, and served as vice president of the Royal Geographical Society in 1862. Mount Everest (q.v.) was named in his honor. He published *An Account of the Measurement of Two Sections of the Meridional Arc of India* (1847).

EV′ERETT. A city in Middlesex Co., Mass., 4 miles northeast of Boston (Map: Massachusetts, E 3). It is on the Mystic River, on the Boston and Maine Railroad, and has electric railroad connection with Boston, Chelsea, Lynn, Salem, and towns of the vicinity. Everett has a large number of manufacturing plants, the principal being chemical works, gas and coke works, structural iron foundries, steel works, and manufactories of radiators, shoes, coal-tar products, leather, beds, concrete blocks, tools, wagons, boxes, trunks, etc. There are two public libraries —the Parlin Memorial and Shute Memorial—and the Whidden Memorial Hospital. The government is administered, under the original city charter of 1892, by an annually elected mayor and a bicameral city council, of which the members of the upper house are elected for two years, one from each ward and one at large, and those of the lower by wards for one year. Of the other municipal officials the more important are nominated by the executive and confirmed by the board of aldermen, and those of less importance are chosen by the city council. One-third of the school board is elected at large, the remainder by wards. Pop., 1900, 24,336; 1910, 33,484; 1914 (U. S. est.), 37,381; 1920, 40,120. Everett was settled in 1643 and remained a part of the town of Malden till 1870. It was chartered as a city in 1892.

EVERETT. A city, port of entry, and the county seat of Snohomish Co., Wash., 33 miles north of Seattle, at the mouth of the Snohomish River, on Puget Sound, and on the Great Northern, the Northern Pacific, and the Chicago, Milwaukee, and St. Paul railroads, and on several lines of Sound and coasting freight and passenger steamboats (Map: Washington, C 2). It is in a rich lumbering, gardening, farming, and copper-gold-and-silver-mining district, and has a fine harbor with several large iron piers. The city trades extensively in lumber, having some of the largest plants in the northwest. Red-cedar shingles are the most important product. There are also ore, paper, and flour interests, and among the chief industrial establishments, large shipyards, paper and flour mills, ironworks, sash and door factories, saw and shingle mills, smelters, and one of the two plants in the United States for saving arsenic from smelter fumes. Everett contains the Pacific College (Lutheran), opened in 1908, a Carnegie library, two hospitals, and the United States customs and assayer's offices. The city has adopted the commission form of government. Settled in 1891, and incorporated two years later, its growth has been rapid because of its favorable situation as a commercial port, its transportation facilities, and its nearness to extensive forests. Pop.. 1900, 7838; 1910, 24,814; 1914 (U. S. est.), 32,048; 1920, 27,644.

EVERETT, Alexander Hill (1792–1847). An American diplomatist and political writer. He was born in Boston, Mass., the son of the Rev. Oliver Everett, and brother of the orator Edward Everett. He graduated with highest honors at Harvard in 1806, was admitted to the bar, appointed United States chargé d'affaires at The Hague in 1818, and Minister at Madrid in 1825. Upon his return in 1829 he became proprietor and editor of the *North American Review* and was elected to the Massachusetts Legislature. In 1840 he was sent by the government to Cuba as confidential agent, and appointed in 1845 to a diplomatic post at Peking, a post which he held at his death. His literary activity began early. He made frequent contributions to the *Monthly Anthology* (1803–11). His first important book, *Europe, or a General Survey of the Political Situation of the Principal Powers, with Conjectures on their Future Prospects* (1822), was translated into German, French, and Spanish. A similar work on *America* appeared in 1827, having been preceded by *New Ideas on Population* (1822). Other books were *Critical and Miscellaneous Essays* (1845–47) and Lives of Joseph Warren and Patrick Henry in Sparks's *American Biography*. Frequent contributions, literary and political, to the *North American Review* and economic essays in the *Boston Quarterly* attest the unremitting labors of a busy life. He shared something of his brother's oratorical power, the more noteworthy of his published orations being "The French Revolution," "The Battle of New Orleans," and "The Battle of Bunker Hill."

EVERETT, Charles Carroll (1829–1900). An American Unitarian clergyman and educator, born at Brunswick, Me. He graduated at Bowdoin College in 1850 and studied in Berlin in 1851–52. After teaching languages at Bowdoin College and being librarian there, he graduated at Harvard Divinity School (1859), and for 10 years was pastor of the Independent Congregational Church (Unitarian) at Bangor, Me. In 1869 he became Bussey professor of theology and in 1878 dean of Harvard Divinity School. In 1872 he began his lectures on East Asiatic religions, one of the earliest American courses on "comparative religion." His principal publications are: *The Science of Thought* (1869; rev. 1890); *Religions before Christianity* (1883; in Dutch version for school use); *Fichte's Science of Knowledge* (1884); *Poetry, Comedy, and Duty* (1888); *Ethics for Young People* (1891); *The Gospel of Paul* (1893); *Psychological Elements of Religious Faith* (1902); *Immortality and Other Essays* (1902); *Theism and Christian Faith* (1909). He was a founder and editor of the *New World*. Consult articles on Everett in the December, 1900, number of the *New World* by C. H. Toy, N. P. Gilman, and Josiah Royce.

EVERETT, Edward (1794–1865). An American statesman, orator, and scholar. He was born at Dorchester, Mass., April 11, 1794; was at one time a pupil in a Boston school of which

Daniel Webster, in the absence of his brother Ezekiel, was the teacher; graduated at Harvard in 1811; and in 1813 became the pastor of the Brattle Street Church (Unitarian) in Boston. As a preacher, his career was brilliant though brief. He resigned his pastorate early in 1815, when not quite 21 years of age, to accept the Eliot professorship of Greek literature at Harvard. To fit himself more completely for this position he went to Europe, studied for two years in the University of Göttingen, where he received the degree of Ph.D., and then traveled extensively in England and on the Continent. Upon his return in 1819 he entered upon the duties of his professorship, delivering at the outset a course of lectures on ancient Greece, which he afterward repeated in Boston. From 1820 to 1824 he was also the editor of the *North American Review,* to which he contributed a great number of articles. In 1824 he was elected to Congress from the Cambridge district and was subsequently elected four successive times. During the whole 10 years he was a member of the Committee on Foreign Relations and in the Twentieth Congress was its chairman. In 1836 he became Governor of Massachusetts, which office he held by annual reëlection until 1840, having been defeated for an additional term, in the election of 1839, by a single vote. From 1841 to 1845 he was Minister Plenipotentiary of the United States to Great Britain. Returning in 1846, he reluctantly accepted the presidency of Harvard University, which position, however, he resigned in 1849. He then established himself in Boston with the purpose of entering upon literary tasks long postponed. He was summoned to fill the place of Secretary of State in the cabinet of President Fillmore, made vacant by Mr. Webster's death (1852). He held this position only four months, retiring at the close of President Fillmore's administration. Before leaving the Department of State he was elected to the United States Senate. Everett represented the conservative Whigs and was looked upon as Webster's political executor, insisting upon the inviolability of the Constitution and recognizing the presence and possible continuance of slavery. His health failing, he resigned his seat in the Senate in May, 1854, and retired to private life. In 1860 he was nominated for Vice President of the United States by the Constitutional Union party (q.v.). The ticket received 590,631 votes out of a total of 4,680,193, and 39 electoral votes, those of Kentucky, Virginia, and Tennessee, out of 303. When the Civil War broke out in 1861, he took his stand promptly with those who were determined to maintain the Union at every hazard. In the great crisis of 1864, when Lincoln was reëlected, Everett's name headed the list of presidential electors of Massachusetts, and the casting of his vote for Lincoln was the last act in his political career. On Jan. 9, 1865, he spoke in Faneuil Hall in behalf of the needy and suffering citizens of Savannah, and on the following Sunday, the 15th, he died. His orations and speeches have been published in four volumes (Boston, 1850–92), but there is no adequate biography. Considerable biographical material, however, is contained in *A Memorial of Edward Everett from the City of Boston* (Boston, 1865); and in Dana, *An Address upon the Life and Services of Edward Everett* (Cambridge, 1865).

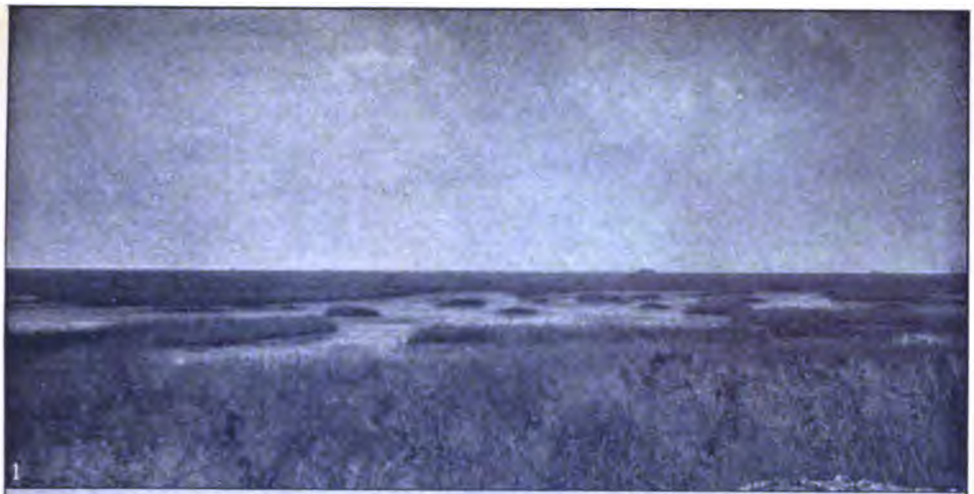
EVERETT, James (1784–1872). An English Wesleyan clergyman, born at Alnwick, Northumberland. In 1806 he entered the ministry. In 1847 appeared *Fly Sheets,* which severely criticized the condition of affairs among Wesleyans. Everett, supposed to be the author, was expelled from the denomination, together with Rev. James Dunn and Walter Griffith. These men then formed the organization which was eventually the Methodist Free church. Everett was the author of many works, the most important being: *The Village Blacksmith, or, Life of Samuel Hick* (which passed through more than 15 eds.); *The Walls End Miner: A Life of William Crister* (3 eds., 1835–51); *Adam Clarke Portrayed* (3 vols., 1843–49); with James Holland, *Memoirs of James Montgomery* (7 vols., 1854). Consult R. Chew, *James Everett: A Biography* (London, 1874).

EVERETT, William (1839–1910). An American educator and author, the son of Edward Everett. He was born at Watertown, Mass., graduated at Harvard in 1859, and at Trinity College, Cambridge, England, in 1863, and was assistant professor of Latin at Harvard in 1870–77, and in 1878–93 was master of the Adams Academy at Quincy, Mass. As a democratic member of Congress (1893–95), he was an active civil service and tariff reformer. In 1897 he again became master of Adams Academy. He published *On the Cam* (1865); *Changing Base* (1868); *Hesione, or Europe Unchained,* a poem (1869); *Double Play* (1870); *Italian Poets since Dante* (1904); *Peace or War* (1909).

EVERGLADES. A vast fresh-water marsh lake in southern Florida, beginning about the southern end of Lake Okeechobee (q.v.) and extending southward through Palm Beach, Lee, Dade, and Monroe counties, for approximately 110 miles. Its width is about 45 miles, its eastern boundary being from 5 to 25 miles from the Atlantic coast, while its western limits are at a mean distance of about 50 miles from the Gulf of Mexico. Big Cypress Swamp forms part of the western boundary in southern Lee County. Several small streams, such as the Miami, Little, and New rivers on the east and the Shark and Harney on the southwest, drain this region, but none flow into it. The water, which is comparatively sweet and pure, is supplied by Lake Okeechobee and a copious rainfall, especially from May to October, when the precipitation amounts to 6 or 8 inches a month. Its depth varies from about 1 to 6 feet, but lessens considerably during the period of least precipitation. There are occasional islands, on which grow cypress, palms, pines, and rich tropical vegetation, while here and there are open water spaces; but excepting these variations the Everglades are generally covered by an extraordinarily dense growth of "saw-grass" (*Cladium effusum*), which rises from 2 to 6 feet, or even more, above the water's surface, and gives the landscape the general appearance of an immense prairie. Over large areas this growth is so dense as to be actually impenetrable, and progress can be made only by cutting a passageway through it, or by following the meandering of the natural lanes caused by the currents.

These conditions have made practically impossible an accurate and complete survey of this region. It is supposed, however, that the marsh lies in a great basin of limestone, the outcrop of which appears a few miles north of Cape Sable and which extends northward to Lake Okeechobee. The southeastern margin of the marsh, as far as it has been explored, consists

THE EVERGLADES



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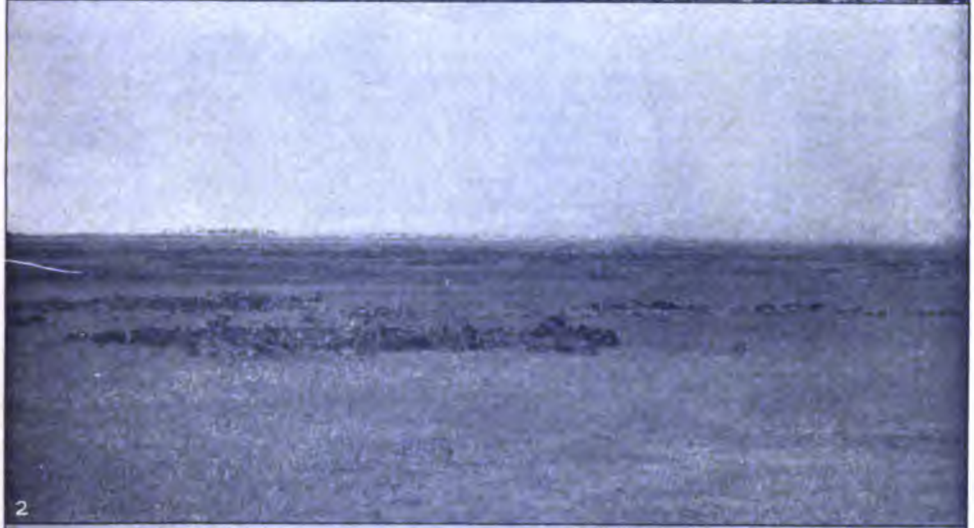

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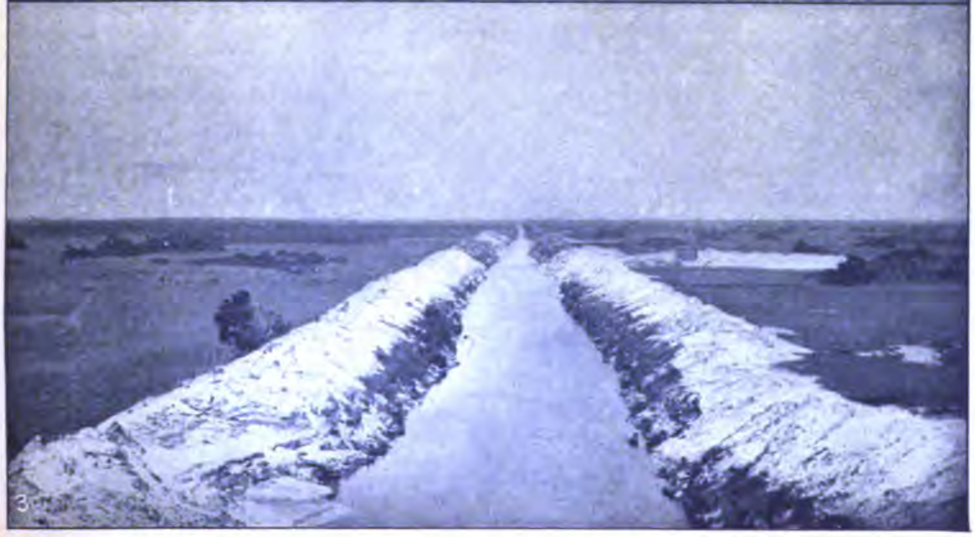
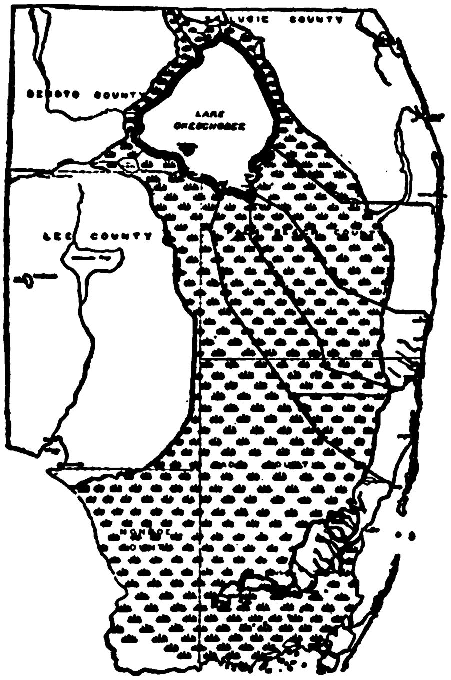


3

1. VIEW OF THE EVERGLADES WEST OF FORT LAUDERDALE, FLORIDA, LOOKING NORTH.
2. VIEW FROM THE SAME POINT, BUT LOOKING SOUTH.
3. DRAINAGE CANAL IN THE EVERGLADES WEST OF FORT LAUDERDALE, LOOKING WEST.

of a rim of this rock, which rises a foot or more above the level of the water. This level is from 16 to 20 feet above the sea. It is known, too, that, although there are many confusing currents, the general movement of the water is consistently southward. These facts have long been appreciated, and prompted the belief many years ago that the Everglades could be reclaimed. In 1845 the Legislature of Florida memorialized Congress on this subject, and in 1847 the Secretary of the Treasury, R. J. Walker, appointed Buckingham Smith to report to him his opinion of the feasibility of the plan. In 1850 Congress passed the Arkansas Act, or Swamp and Overflowed Land Grant Act, under which virtually all of the Everglades were patented to the State of Florida; and in 1855 Florida passed an Act creating the Trustees of the Internal Improvement Fund to promote the reclamation project. In 1881 a private company undertook to build a drainage canal from Lake Okeechobee to the Caloosahatchee River, but the work was not well planned and did not succeed. In 1906 the State adopted a fairly definite plan, and the actual work was begun. The plan provided for a series of main canals, to be dredged from the coast to Lake Okeechobee, the object being to lower the level of the lake by about 2 feet, to prevent the overflow of its waters into the Everglades once the water level there had been lowered by these canals. In 1913 five such canals had been completed, and several others had been recommended for construction. The feasibility of actually draining the greater part if not virtually all of the Everglades has been admitted by several expert engineers, and rich crops of sugar cane and garden truck have been grown upon some of the land thus reclaimed. There is, however, difference of opinion as to whether all of the land thus reclaimed will be valuable for agricultural purposes. See **Drainage.**



EVERGLADES.

Apparently the first white man to enter the Everglades was a Spaniard, Escalente de Fontenada, who, after being shipwrecked in the Straits of Florida, was taken prisoner and made a slave by the powerful cacique, Calos, known as the Lord of the Everglades. The only other human beings known to have made their home in these fastnesses are the remnant of the Seminole Indians (q.v.) who fled hither after the virtual subjugation of their tribe in 1842. Several expeditions have traversed or explored parts of the Everglades, the more important being those of Major A. P. Williams in 1883, J. E. Ingraham in 1892 (the first actually to cross the great marsh lake), and Lieut. Hugh L. Willoughby in 1897. Considerable literature about this mysterious region has been produced. For the various acts, reports, and other official papers relating to the reclamation scheme, and including much information concerning the region, consult *The Everglades of Florida*, Senate Document No. 89, 62d Congress, 1st Session (Washington, 1911), for progress of the work up to 1914, *Florida Everglades*, Report of the Florida Everglades Engineering Commission, Senate Document No. 379, 63d Congress, 2d Session (ib., 1914), and for a readable description of the country, Lieutenant Willoughby's account of his expedition, *Across the Everglades* (Philadelphia, 1898). Rhodes and Dumont in *A Guide to Florida* (New York, 1912) present a good brief description; and of the numerous magazine articles the following are especially worthy of notice: Dix and MacGonigle, "The Everglades of Florida," in the *Century Magazine*, vol. lxix (February, 1905); Willey, "Reclaiming the Everglades," in *Cassier's Magazine*, vol. xxxix (March, 1911); id., "Draining the Everglades," in the *Scientific American*, vol. civ, No. 2 (Jan. 21, 1911); and Dimock, "The Passing of a Wilderness," in *Scribner's Magazine*, vol. xli (March, 1907).

EV'ERGREEN. A town and the county seat of Conecuh Co., Ala., 99 miles east-northeast of Mobile, on the Louisville and Nashville Railroad (Map: Alabama, C 4). It is a winter resort, noted for its mineral springs, and has the Second Congressional District Agricultural School and Experiment Station and the State Baptist Orphanage. The town is interested chiefly in agriculture, lumbering, and market gardening, and contains a veneer mill, box factory, and saw mill. The water works and electric-light plant are owned by the municipality. Pop., 1900, 1277; 1910, 1582.

EVERGREEN. A plant which retains its foliage organs throughout the year. Evergreens contrast naturally with deciduous trees. These latter shed their leaves periodically and are leafless for some portion of the year; whereas the leaves of evergreens are more persistent and are either not shed periodically or the old leaves are retained until after the new ones have expanded. The term "evergreen" is used particularly in the case of trees, and the forests of the world are subdivided into various ecological groups, the basis for which is the nature of the foliage, whether deciduous or evergreen. Evergreen forests are again subdivided into the northern or conifer types, the sclerophyll or winter-rain type, and the tropical type in regions whose atmosphere is always moist. In the last type all gradations are to be found between the deciduous and the evergreen habit. See **Forest; Leaf.**

EV′ERHART, Benjamin Matlack (1818–1904). An American author and botanist. He was born near Westchester, Chester Co., Pa., and spent the first 40 years of his life in mercantile pursuits. In 1867 he retired from business and devoted himself to botanical research and to gathering and arranging a great collection of fungi, comprising thousands of specimens. He discovered nearly 300 new species of lichens, mosses, and liverworts, and became known as one of the greatest authorities in this branch of botanical science. In association with J. B. Ellis he founded the *Journal of Mycology*, the publication of which was subsequently taken up by the United States government. Nine plants have been named in his honor. His principal publications are *Ellis's North American Fungi*, and *The North American Pyrenomycetes*, with original illustrations by W. F. Anderson (1892), a valuable monograph.

EVERLASTING FLOWER. A name given to various flowers, among which are certain species of *Amaranthus* (q.v.) and of *Helichrysum*. See Immortelle. See Plate of Goldenrod.

EVERLASTING GOSPEL. See Joachim of Floris.

EVERLASTING PEA. See Lathyrus.

EV′ERMANN, Barton Warren (1853–). An American ichthyologist, born in Monroe Co., Iowa. He graduated from Indiana University in 1886. After serving for 10 years as teacher and superintendent of schools in Indiana and California, he was professor of biology at the Indiana State Normal School in 1886–91. Entering the service of the United States Bureau of Fisheries in 1888, he became ichthyologist in 1891, had charge of the division of scientific inquiry in 1903–11, and from 1910 to 1914 was chief of the Alaska Fisheries Service. He lectured at Stanford University in 1893–94, at Cornell in 1900–03, and at Yale in 1903–06. He was also United States fur-seal commissioner in 1892 and became chairman of the fur-seal board in 1908. His publications include bulletins and reports of the United States Fish Commission and contributions to the proceedings of various societies.

EV′ERSLEY, Charles Shaw-Lefevre, Viscount (1794–1888). An English politician. He was born in London, was educated at Trinity College, Cambridge, was called to the bar in 1819, and entered Parliament in 1830, where he became a steady supporter of the Whig government. He was Speaker of the House of Commons from 1839 to 1857, when he was retired on a pension and made a peer. He served longer than any previous Speaker save Arthur Onslow, who held the office nearly 34 years.

EVERSLEY, George John Shaw-Lefevre, first Baron. See Shaw-Lefevre.

EVERY MAN IN HIS HUMOUR. Jonson's first extant comedy, produced at the Globe in 1598, Shakespeare himself taking a part, and printed in 1601. It proved the most vital of Jonson's plays. Garrick, after revising the piece, played the part of Kitely with great success.

EVERY MAN OUT OF HIS HUMOUR. "A Comicall Satyre," by Ben Jonson, produced in 1599 and published in 1600.

EVESHAM, ēvz′*am*, originally **EOVESHAM.** A municipal borough and market town in Worcestershire, England, on the right bank of the navigable Avon, 15 miles southeast of Worcester (Map: England, E 4). It lies in a beautiful and fertile vale and has for many years been noted for market gardening. It is well built and lighted by gas. The gas works and water supply are owned by the municipality, which also maintains baths and washhouses, public recreation grounds, two public halls, and a public library. It has a grammar school founded in 1546 and a free public school. It has manufactures of gloves and hosiery. An abbey was founded here about 700, of which nothing remains but a fine tower and gateway. The town had its first charter in 1604 from James I. It was the scene of Simon de Montfort's defeat by the royal troops Aug. 4, 1265, terminating the Barons' War. Pop., 1901, 7101; 1911, 8341. Consult New, *A Day at Evesham* (Evesham, 1881), and id., *Evesham* (London, 1905).

EVET. See Eft.

EVIC′TION (Lat. *evictio*, from *evictus*, p.p. of *evincere*, from *ex*, out + *vincere*, to conquer). The expulsion or removal of a tenant from the possession of real property either by his landlord or by another acting under a paramount title. The term was formerly confined to dispossession by legal process, but it is now applied to every form of dispossession under a title superior to that of the person evicted. Disturbance of possession by a stranger, i.e., by one having no title to the lands in question, is not an eviction, but a trespass, punishable by a tort action. An eviction, on the other hand, whether rightful or wrongful, is not a trespass and is not punishable as for a wrong. Its effect is confined to the dissolution or modification of the relation of landlord and tenant between the lessor and lessee.

An eviction by a landlord of a tenant at will or at sufferance, or of a tenant who has forfeited his estate by the commission of waste, or by the breach of any condition on which the lease depended, is the normal and proper mode of terminating the relation between the parties. The eviction operates ipso facto to determine the tenancy. A similar act of dispossession of one wrongfully in possession of property by the rightful owner is not an eviction, but is more properly described as a reëntry. (See Entry, Right of.) When, however, the person so in possession claims under a lease from a third person, the process may, from his standpoint and in relation to his landlord, be an eviction. Its effect is to terminate the lease and to set the tenant free from his obligations to his landlord. It is an eviction by paramount title. If the eviction in this case be only partial, however, i.e., from part and not the whole of the premises, the tenant may still be liable to his landlord for so much of the premises as remains in his possession.

On the other hand, if the tenant be unlawfully evicted by his landlord, it is immaterial whether the eviction be total or partial. A lease of land carries with it an implied covenant for the quiet enjoyment of the demised premises (i.e., a covenant that the tenant shall not be disturbed by an unlawful eviction by his landlord or by paramount title), and rests upon the condition that this covenant shall be observed. Any willful eviction from any part of the premises by the landlord's act is a breach of this condition and entitles the tenant to avoid the lease and refuse to pay rent, even though his possession of part of the premises is undisturbed. In this case, however, if the tenant remain in possession of a part of the premises, the rent is only suspended, and he may become liable under the lease again, if he is restored to the part from which he has been evicted.

Strictly speaking, eviction involves the notion of an actual forcible removal or exclusion from the premises held by a tenant, and at common law nothing less than this would protect him against the claims of his landlord under the lease. This rigid rule has been modified in two particulars in certain of the United States. In Massachusetts and a few other States it has been held that when the premises are claimed by paramount title the tenant is not bound to await a forcible removal, but may yield to a demand for possession made on the premises. In New York it has been held that the landlord may effect an unlawful eviction, and thus release his tenant from his obligations under the lease, without any physical interference, by the process known as a "constructive eviction." This consists of a nuisance willfully maintained by the landlord, either upon or in close proximity to the tenant's premises, of such a character as to deprive the tenant of his rightful enjoyment of them and force him to abandon them. This doctrine has also been applied to a variety of acts or omissions by a landlord which do not come under the ordinary description of a nuisance, such as the refusal of the proprietor of an apartment house to furnish the heat or the elevator service stipulated in the lease. The courts have, upon the contrary, refused to carry the principle to the extent of permitting a tenant to claim a constructive eviction and abandon the premises because of the landlord's failure to make promised repairs, even though the premises are rendered untenantable by such failure.

The rights accruing to a tenant under an eviction may usually be supplemented by a right of action against the landlord for damages, and the tenant may recover under the covenant of quiet enjoyment from the lessor the damages sustained by him as the result of the breach. See LANDLORD AND TENANT, and the authorities there cited.

EVIDENCE. The means by which the truth or untruth of any relevant fact is established in the trial of an action at law. What is and what is not legal evidence is determined primarily by the pleadings in the action. The early common-law system of pleading was so devised as to narrow down all matters of dispute between the plaintiff and defendant to a single issue of law or fact. If the issue was one of law, a question was raised for the court only; but if the issue was one of fact, a question was raised for determination by a common-law jury, after a trial in which evidence was introduced on the one side to prove the alleged fact and on the other to disprove it. The whole system presupposed, on the part of the jury, inability to consider more than one issue of fact at a time, and in the consideration of that one issue, to some extent, lack of capacity to give to different classes of logically relevant evidence their proper weight. It is to the historical development of the jury system, therefore, that many rules of the law of evidence may be attributed, which now seem to be unwarranted in logic and unsuited to the times.

Modern systems of pleading permit the raising of numerous issues of fact and have thus imposed on the jury duties requiring a higher standard of intelligence than under the ancient system. The rules of evidence, however, partly because they have been found to be practically sufficient and partly because of the necessity of fixed and definite rules in the branch of the law, have not undergone a corresponding change, and many matters of evidence logically relevant and of considerable probative force are still not legally admissible evidence because of their supposed tendency to "confuse and mislead the jury."

I. **Relevancy.** The rule of first importance in the law of evidence is that it must be relevant in order to be legally admissible. Relevancy depends directly or indirectly on the issue raised by the pleadings. Thus, evidence of a fact may be relevant because it tends directly or indirectly to prove or disprove the fact in issue that is affirmed by one side and denied by the other; or because it tends to prove or disprove some matter of evidence already introduced by the other side. But, as has been pointed out, not all logically relevant evidence is legal evidence. Thus, evidence which is logically relevant may not be legally admissible because: (*a*) Its relevancy is slight or remote. Thus, evidence that the defendant was insolvent at a certain time is not admissible to prove that he borrowed money of the plaintiff at that time. (*b*) The evidence is of collateral transactions, or (as is sometimes said) *res inter alios acta*. Thus, in an action to recover damages for negligence it is not permissible to show that the defendant was negligent towards others than the plaintiff, or on trial of a defendant for stealing, that he stole from others. The general rule is, however, subject to many limitations and modifications more or less arbitrary. Thus, it is permissible to show, in an action of tort, brought to recover for injuries caused by a defective appliance belonging to the defendant, that others were injured by it in a similar manner, and, generally, value of land may be shown by proving the selling price of other land similarly situated. The character of a party to a civil action is not regarded as relevant and is therefore not the subject of evidence unless the character is directly put in issue by the pleadings, as in an action for libel. In a criminal trial, however, the defendant may, if he so elects, introduce evidence of his character, which evidence the prosecution may then rebut.

II. **Hearsay.** What others than the witness have said before the trial is not generally admissible in evidence because not sworn to and because not subject to cross-examination. This rule, known as the "hearsay-evidence rule," is subject to several exceptions, the most important of which are the following:

(*a*) *Admissions and Confessions.*—Statements, either oral or written, made at any time by a party to an action or by his predecessor in interest, may be introduced in evidence against him, but not by him or in his favor. The rule is based upon the inherent probable truth of statements which are prejudicial to the interests of the party making them. Under the rule as to predecessor in interest, the admissions of a deceased person are admissible in evidence in actions against his executor, or admissions as to the title of real estate made by its then owner are admissible in an action founded upon the title brought against his subsequent grantor. Admissions made by an agent within the scope of his authority are admissible in evidence against the principal. Confessions are strictly admissions made by one charged with a crime, and, because of the necessity of safeguarding one charged with a crime, are not admissible when obtained by means of threats or promises of favor. This rule has been extended or restricted by statute in many of the States.

(*b*) *Reported Testimony in a Prior Trial.*—In general the testimony of a witness in an earlier trial between the same parties and relating to the same issues, or between parties identical in interest with the parties at the present trial, may be introduced in evidence if the witness is dead, insane, unable to attend the trial, out of the jurisdiction, or kept from appearing at the trial by an opposing party. The testimony in the earlier trial must have been sworn to and subject to cross-examination, thus obviating the usual objection to hearsay evidence.

(*c*) *Dying Declaration.*—Declarations made by a person *in extremis* are admitted in evidence upon the trial of one charged with the homicide of the declarant, either in favor of the prosecution or the prisoner. See DECLARATION, DYING.

(*d*) *Declarations against Interest.*—These are admissions in any form against financial or proprietary interest of the person making them and made by one who at the time of trial is dead. Unlike admissions, they need not be made by one having some connection with the party to the action. Thus, an indorsement written on a note by the holder that a part of the note is paid, or a book entry that a bill has been paid, or a statement that the declarant is a tenant (rather than the owner), are all admissions against financial or proprietary interest, and are admissible in evidence if relevant and if the declarant be dead.

(*e*) *Book Entries.*—Book entries or reports made pursuant to a legal duty or in the usual course of business by one since deceased having personal knowledge of the matter so entered or reported are admissible in evidence to prove the truth of matters contained in the entry. Thus, the book entries of clerks or written reports of officers are admissible in evidence under this head, but not the entries in a diary, because not made pursuant to a duty. Closely related to the rule as to entries made in the course of business is the so-called shop-book rule. This rule varies considerably in different jurisdictions, but the effect in all is substantially to allow a party to an action, although present at the trial in person, to prove an account by introducing in evidence his book of account. He is usually required to make preliminary proof that he is engaged in the business in which the charges in the book are made, and that he has made correct entries. A witness may always be allowed to refresh his memory by referring to memoranda or book entries; in that case the memoranda or book entries are, however, not directly in evidence, and the jury may rely only upon the witness's oral testimony.

(*f*) *Res Gestæ.*—Any statement made at the time of the happening of an event by one who was then present may be introduced when the event itself is in issue or relevant. Such evidence is admitted on the theory that the statement is incidental to the event itself and to some extent characterizes or explains it. Thus, on a murder trial it is proper to prove a statement made at the time of the homicide by any person present, which tended to show that the defendant committed the homicide or that the act was intentional or malicious.

III. **Real Evidence, Writings.** Legal evidence is not limited to the sworn testimony of witnesses. Specific objects, when properly identified by oral testimony, may often be introduced in evidence when their very existence or their character or appearance tends to prove or disprove an alleged fact. Thus models, parts of machinery, weapons, clothing, etc., may be introduced in evidence. Such evidence cannot of course be submitted to an appellate court as a part of the record of the trial, and for that reason the extent to which such evidence may be received may be limited by the discretion of the court, and in some jurisdictions practically no such evidence is admitted. Writings or documents may generally be introduced directly in evidence for the purpose of proving the truth of statements contained in them. At common law documents purporting to be more than 30 years old required no particular authentication, or, as was said, such documents proved themselves. The execution of other documents must, however, be proved by the sworn testimony of a witness to the execution, or, if he be dead, by proof of the handwriting of the person who executed the document.

The so-called best-evidence rule applies to documentary evidence. Briefly stated, it is that the best evidence of the contents of a document is the document itself, and that no other evidence of the contents of a written instrument is admissible. This rule is subject to many exceptions, real or apparent. Thus: (*a*) Where the original document is in duplicate form any one of the duplicates may be introduced in evidence as an original. (*b*) Secondary evidence (i.e., a copy or oral testimony) of a written notice is admissible. (*c*) Matters of public record may be proven by secondary evidence, in most jurisdictions by a certified copy of the record. (*d*) Secondary evidence may also be introduced to prove an instrument which has been lost or destroyed, or whenever the other party to an action, having the document in his possession, fails to produce it at the trial for the purpose of preventing its being introduced in evidence on due notice. One who has willfully destroyed a document will not, however, be allowed to give evidence of its contents. The common-law rule as to proof of documents has been much modified by statute. In most jurisdictions all documents attested before a notary or corresponding officer are prima facie admissible in evidence if relevant.

IV. **The Parol-Evidence Rule.** This is properly a rule of substantive law which is, in effect, that the terms of a contract or other legal instrument should be deemed to be embodied wholly in the written instrument executed by the parties thereto, or, stated in terms of evidence, the rule is that parol or oral evidence shall not be introduced for the purpose of varying the terms of a written instrument. The rule, though necessarily subject to many exceptions, is founded upon the just notion that, when parties have deliberately embodied their agreement or transactions in writing, they should not thereafter be allowed to dispute its terms. The following are the most important cases in which evidence to vary the express terms of a written instrument may be given:

(*a*) Where the parties did not intend to reduce all the terms of the agreement to writing.

(*b*) When the writing or agreement is varied by a subsequent parol agreement.

(*c*) When the evidence is introduced to show that the written instrument has never taken effect because of the nonoccurrence of some agreed condition precedent.

(*d*) When a term of the instrument is ambiguous and parol evidence is necessary to explain the meaning, and upon analogous grounds where the term of a written instrument has a technical or local meaning requiring oral explanation.

(*e*) When the proof of a custom which is in law a part of a contract or other document varies the effect or meaning of the written language.

(*f*) When in equity an action is brought to reform or rescind a written instrument, or construe a conveyance as a mortgage.

V. **Opinion Evidence.** In general witnesses are allowed to testify only as to facts, and not as to their inferences or opinions based upon facts within their knowledge. To permit the witness to indulge in opinion testimony would be a usurpation of the function of the jury, whose duty it is to draw inferences of fact and to form an opinion, where an opinion is necessary to the verdict. Thus, the witness, when the facts of a conversation are in issue, must testify as to the terms of the conversation and not his conclusions as to its meaning. There are, however, three important exceptions to the rule that opinion evidence is inadmissible. They are: (*a*) Matters of common experience; matters of common knowledge to a certain extent the result of inference. Thus, to testify that a certain day was cold, or that a knife was sharp, involves the operation of the witness's mind in drawing a conclusion; but since these are matters of common experience about which the conclusions of the witness are as trustworthy as those of a jury, such testimony is legally admissible as evidence. (*b*) Matters not of common experience, but about which the opinion of the witness is under the circumstances more trustworthy than any which could be formed by the jury. Thus, a witness may be so situated with reference to an event or combination of circumstances as to be able to draw a more accurate conclusion from them than the jury, which should rely wholly upon verbal testimony about the occurrence. Thus, the witness may be allowed to give his opinion of the distance between an approaching street car and a pedestrian before warning of the approach was given; or, under certain circumstances, he may be allowed to give his opinion of the rate of speed at which the car was moving. His presence at the time of the event enables him to form a more accurate opinion than the jury, which can only rely upon a necessarily imperfect description of the occurrence. (*c*) Expert testimony. A witness may be allowed to testify as to his opinion because, by reason of experience or special study and investigation, he is better qualified to form an opinion than the jury. Thus, physicians, engineers, handwriting experts, etc., are allowed to give opinion evidence in order to aid the jury in reaching a correct conclusion. They are not allowed, however, to express any opinion as to the truth or untruth of other evidence submitted to the jury, that being a matter of which the jury is qualified to judge. The testimony of experts, so far as it is opinion evidence, is based upon the evidence already before the jury, assuming it or parts of it to be true. For that reason questions asked of expert witnesses are usually required to be hypothetical in form.

VI. **Witnesses' Competency.** A witness is not competent to testify until he has taken oath to testify truly. At common law an atheist or other unbeliever in the Christian religion was not a competent witness, because it was believed that he would not feel constrained by his oath to testify truly. At the present time a witness is generally allowed to testify on his oath or affirmation, no particular religious belief being requisite. A child is a competent witness if old enough to understand the nature and obligation of an oath, and an insane person may testify upon a matter concerning which his understanding is not affected by his insanity. At common law one convicted of a felony within the jurisdiction was incompetent as a witness unless pardoned. In most jurisdictions such a conviction now affects the credibility only, and not the competency of the witness. At common law a party to an action was not a competent witness in his own behalf, nor was one a competent witness if directly interested in the controversy. This disability has been generally removed by statute. Nor could either the husband or wife testify for or against the other at common law. This disability has been removed to some extent by statute in most jurisdictions, but not generally so as to permit testimony as to confidential communications between husband and wife.

It was the policy of the common law to protect the witness from being compelled to incriminate himself. He is therefore privileged from giving any testimony which tends to incriminate him or to subject him to a penalty or forfeiture. If the witness does not claim his privilege, his testimony is competent and subject to the usual rules of the law of evidence. Having once fairly waived his privilege, he must testify fully. Thus, a defendant in a criminal trial is privileged from being compelled to testify; but having offered to testify in his own behalf, he must answer proper questions directed to him on cross-examination. At common law, also, an attorney and client were privileged from testifying as to any confidential communication between them. By statute this privilege has in most jurisdictions been extended to persons standing in other confidential relationships, e.g., physician and patient, clergyman or priest and layman, and in some jurisdictions, notably New York, attorneys, physicians, and clergymen are not competent to testify as to confidential communications received by them in their professional capacity. Upon the similar ground of public policy a party is privileged from testifying as to his efforts or willingness to compromise the matter in controversy, and it is probable that the President of the United States and the governors of States are privileged from appearing as witnesses under any circumstances.

VII. **Examination of Witnesses.** Witnesses may be classified as favorable or opposing. A favorable witness is one called by a party to testify in support of his contention in the controversy, and an opposing witness is one called by the other party to the controversy to testify in his behalf. The favorable witness on one side is therefore the opposing witness of the other. As a general rule, one is not allowed to ask his own (or favorable) witness leading questions, i.e., questions which by their form indicate the answer desired. The extent to which leading questions may be asked, however, rests in the discretion of the trial judge, and should the witness prove hostile leading questions may be asked. One may not impeach the credibility of his own witness, i.e., he is not allowed to introduce testimony to show generally that the witness is not worthy of belief. He may, however, contradict the testimony of the witness by other witnesses for the purpose of showing the truth as to a fact about which the first witness has testified. At the close of the direct examination, or the examination of a favorable witness, counsel for the other side may cross-examine, i.e., may examine him as an opposing witness. On cross-examinations it is permissible to ask leading questions. The cross-examiner may also attack the credibility of the witness, and for that purpose may ask questions not otherwise relevant. The credibility of an opposing witness may also be attacked by introducing testimony to show that he is generally unworthy of belief.

The Burden of Proof. From the nature of pleading and the trial of an action at law it follows that upon one party or the other to the controversy rests the burden of introducing some evidence in order to establish his contention. The burden of proof is said to rest upon the party against whom a judgment must be given if no evidence be introduced in his favor. The same doctrine is stated in slightly different terms by saying that the burden of proving a fact rests upon him who asserts the existence of the fact in his pleading, and not on him who denies it. The party on whom the burden rests may, by the introduction of some evidence, make out a prima facie case, and then arises the legal necessity for the other party to introduce evidence enough to destroy the prima facie case of his opponent. Thus, at various stages of the trial the burden of introducing evidence may shift from one side to the other. It is evident, therefore, that the common expression that the burden of proof shifts during the progress of a trial is not exact, unless the word "proof" be taken in the sense of attempt to establish the truth of a fact, and not in its usual legal sense as such evidence as satisfies the mind. In civil trials the party on whom rests the burden of proof must sustain his case by the preponderance of evidence. In criminal trials the burden of proof rests upon the prosecution, which is required to prove its case beyond a reasonable doubt. In sustaining the burden of proof the party upon whom the burden rests is aided in making proof by the doctrines of judicial notice and of presumption. It is unnecessary to prove facts of which the court will take judicial notice. In general these are facts of such common and universal knowledge that it would be idle to prove them by affirmative testimony. Thus (to cite a few of the innumerable cases), it is unnecessary to prove the calendar, the multiplication table, that water will freeze, or that ice will melt. The party sustaining the burden of proof is also aided in making proof by proving one fact or set of facts from which certain consequences are presumed to flow. (See PRESUMPTION.) All so-called circumstantial evidence is intended to create a presumption of some other fact sought to be proven.

In general courts of equity follow the rules of evidence as adopted by the common-law courts.

In the United States the Federal courts in civil cases usually follow rules of evidence applied by the local State courts. In criminal trials they follow the common law as interpreted by the Federal courts and as modified by Federal statutes. In the several States the common-law rules of evidence are generally followed with comparatively few statutory modifications. Consult: Greenleaf, *Treatise on the Law of Evidence* (16th ed., Boston, 1899); Thayer, *Preliminary Treatise on Evidence at Common Law* (ib., 1898); id., *Cases on Evidence* (ib., 1900); Stephen, *Digest of the Law of Evidence* (6th ed., London, 1904); Best, *Principles of Evidence* (9th ed., ib., 1902); Wigmore, *System of Evidence in Trials at Common Law* (Boston, 1904); id., *Cases on Evidence* (ib., 1913); Chamberlayne, *Treatise on Evidence* (4 vols., Albany, 1911).

EVIDENCES OF CHRISTIANITY. A term often used as the equivalent of apologetics. (See APOLOGY.) Sometimes apologetics is used in the wider meaning of a systematic statement of the nature of Christianity and its place in the human development, so framed as to meet the objections which have been raised against it, while the evidences of Christianity is kept for a narrower and more specific answer to current objections. The evidences most effective in any age or portion of the Church depend upon the conception of Christianity emphasized, and the nature of the objections to be met. Since Christianity has been conceived differently in different ages, the evidences presented have also differed. In the first period of its history, represented by the writers of the New Testament, Christianity was the belief that Jesus was the Jewish Messiah foretold by the prophets and that He would come again to inaugurate the messianic kingdom. The evidences consisted largely in the attempt to prove that Jesus fulfilled the messianic predictions of the Old Testament; to which Paul added that the Old Testament also looked forward to the extension of the work of the Messiah to the Gentile world (Matthew, Hebrews, Paul's letters). As Christianity entered the Gentile world, it met a new field of thought, demanding new evidences. Aside from answers to the slanders against the moral life of the Christians, two kinds of evidence were demanded—that which met the popular polytheism and that which met the Greek philosophy. In time the Christian apologists passed from the defensive to the offensive. They attempted to show that idolatry was absurd; that a revelation by the Creator was reasonable; that Christianity was foreshadowed by the Greek philosophy as well as by the Hebrew prophets; and that its moral results in the lives of its adherents proved its divine origin. Most of the Church fathers contributed to the body of evidences, notably Justin Martyr, Aristides, Tertullian, Clement (*Stromateis*), Origen (*Against Celsus*), Arnobius, Cyril of Alexandria (*Against Julian*), Eusebius (*Præparatio Evangelica*), Augustine (*De Civitate Dei*). After the fall of paganism the evidences lose their practical character and become philosophical defenses of the current theology. Such are Anselm's *Monologion* and *Proslogion*, and Abelard's *Dialogue between a Jew and a Christian*. After the Reformation philosophy was freed from the trammels of the Church, an active and aggressive skepticism arose, and the evidences of Christianity once more became vital. In Germany, France, and England rationalism and deism (q.v.) arose in the seventeenth century, denying revelation and affirming the sufficiency of natural religion. This was an attack upon the current conception of Christianity as a miraculous revelation presenting the only adequate knowledge of God which man possesses, and the evidences which it called forth were concerned with a defense of supernatural revelation. Deism admitted the existence of God and the fact of sin and judgment. In a work which has become a classic in theology, *The Analogy of Religion, Natural and Revealed, to the Course and Constitution of Nature* (1736), Bishop Butler used these admissions as the basis for an argument that revealed religion follows directly from natural religion. In the eighteenth century David Hume (q.v.) attacked the credibility of miracles, appeal to which had been the chief defense of the supernatural character of Christianity. The most famous reply was Paley's *View of the Evidences of Christianity* (1794). His argument was that the Apostles must be regarded as credible witnesses to the miracles, since they endured suffering and persecution solely because they believed that certain miraculous events had taken place. During the nineteenth century the problem of the supernatural was approached from another standpoint, and positivism, agnosticism, and skepticism were met by a theistic view of the universe. Meantime the argument from experience, though playing no great part in the classic works of the English apologists, had been developed, especially by the mystics. The greatest statement of this argument is Pascal's *Pensées*.

The books of Evidences which present the classic argument usually gather up the various lines of proof used in the different periods of history and present them in systematic order. 1. A personal God is the creator and governor of the universe. This presents the Christian theory of the universe as over against the pantheistic or materialistic theory. 2. God has made a revelation of Himself to man through nature and through the Hebrew religion. 3. These revelations were imperfect, and are perfected by the revelation through Christ. This revelation, attested by miracles, consists of His teaching regarding God as the Father of men, His perfect life of obedience to God, and His death and resurrection, by which God assures man of His love and readiness to forgive. 4. The testimony of the Apostles and Paul confirms the revelation of Christ. 5. The moral superiority of Christianity is shown by its triumph over paganism and by the moral progress of Christian civilization. 6. Individual experience shows that Christianity brings satisfaction for religious needs, and the sense of communion with God. The argument from experience, while it cannot be made a compelling proof to the unbeliever, has always been claimed as a satisfactory and complete argument to the believer.

The older Evidences contain much which is aside from present thought. The discussion has moved to other fields and needs other arguments. The older argument was adapted to a view of the world which drew a sharp distinction between nature and the supernatural. Christianity was regarded as a supernatural revelation breaking into the mechanical realm of nature. It was miraculous in content and depended chiefly upon miracles to prove its supernatural character. The content of the revelation was regarded largely as a philosophical system, belief in which was held to be necessary. The present view of the world draws no such sharp distinction between nature and the supernatural. Nature itself is the unfolding of the purpose of God, and revelation comes in it rather than breaks violently into it from without. A greater appreciation of the human elements in the Bible has made it possible to offer other explanations of some of the narratives of miracles than those formerly given. Comparative religion has shifted the ground from the problem of the abstract truth of Christianity to that of its practical value. The present question is, Does Christianity meet the religious and ethical needs of humanity better than do other religions? The problem is no longer philosophical, but practical, and the grounds of the evidence must shift accordingly. The evidences which meet the needs of the present day concern themselves chiefly with the teaching of Jesus. They try to show that His central principle of love to God and to man is (1) the highest possible ethical and religious ideal, for perfect love would be perfect harmony with the God of love. This makes Christianity the perfect religion, for none can claim a higher ideal without destroying the independence of personality. (2) When embodied in conduct, it becomes the perfect ideal of ethics. It adapts itself to all phases of civilization. The goal which Christianity sets, the kingdom of God, satisfies the highest social longings of humanity, for it is the ideal of a society in which the absolute righteousness shall rule. The religion is capable of infinite progress, for it is a religion of principles, not of precepts; and the principles of love and righteousness can never be superseded, but may be applied through any conceivable future history with ever-increasing success. These ideals are exemplified in the character of Jesus. He Himself lived His own religion; and Christianity claims that His character remains in history as the type towards which all characters should approach. The evidence which appeals to the present day attempts to show that Christianity is both the highest and the most practical religion which history offers to man. It cares less for miracle than did the older Evidences, and more for life.

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E'VIL (AS. *yfil*, Goth. *ubils*, OHG. *ubil*, Ger. *übel*, evil; probably connected with Goth. *ufar*, OHG. *ubar*, Ger. *über*, AS. *ofar*, Eng. *over*, Lat. *super*, Gk. *ὑπέρ*, *hyper*, Skt. *upari*, over). Evil may be generally defined as frustrated desire, or the cause or causes of frustrated desire. If a being had no wants, no desires, no aspirations, for that being nothing could be an evil. His own destruction would be a matter of absolute indifference, and all his experiences would be mere colorless events. It is often said that for science there is no evil in the universe. But this statement presupposes that all is law and order in the universe, and that this uniformity of law in nature is what man as an intellectual being desires. For a being that wishes to know, ignorance and all causes of ignorance are evil; and chaos would be an insuperable bar to knowledge, hence would be an evil. The law-abidingness of nature makes knowledge possible, hence is for an intelligent being good. But man has other desires than curiosity to know. And whatever thwarts any of these desires is so far evil. Evil is absence of food for the hungry, lack of water for the thirsty, rebuff for the lover, disappointment for the ambitious, death for him who is filled with a lust for life, and life for him who is weary of it. To the person, therefore, who inquires why there is evil in the world the answer given must be: "Because in the world there are beings possessed of desire, and not possessed of the means to satisfy desire." This was the great insight of Gautama the Buddha. His practical conclusion was to secure the suppression of desire. Another equally justified conclusion would be the social ordering of life so that in general satisfaction may be obtained. We have thus opposed to each other the ideal of self-repression and that of self-realization. Usually the question has reference to *moral* evil. But, as an evil, moral evil differs no whit from any other evil. It is an unsatisfied desire or its cause. When the evil is moral, the unsatisfied desire is for a moral order. (For a discussion of the question what morality and moral order are, see ETHICS.) What makes moral evil more serious than other evils is the fact that common human interests are more intimately and more extensively concerned in the moral order than in anything else.

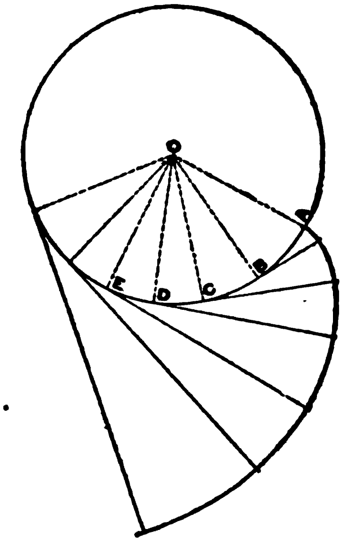
Many theological and philosophical answers have been given to the question as to the origin of evil. Thus, the dualism of Zoroaster maintains that evil arises from the action of Ahriman in his ceaseless antagonism to Ormazd. (See AVESTA; ZOROASTER; MANICHÆISM; GNOSTICISM.) Traditional Christian theology traces human evil to the fall of Adam and Eve, which, according to the account in Genesis, was brought about by the agency of the serpent. In accordance with later Hebrew tradition the serpent was regarded as representing Satan, the personal principle of evil in the universe. Satan differs from Ahriman in not being coördinate with the principle of good. This opens the question of the relation between Satan and God, which has furnished opportunity for many a theological controversy. Again, many philosophers and theologians give a rationalistic account of the origin of evil by saying that it is a metaphysical counterpart of good; that it is as impossible to conceive good without evil as it is to conceive an inside without an outside. Others again make evil a necessary result of finitude; whatever is limited is ipso facto evil. Most of the puzzles connected with the problem of evil are theological rather than scientific, i.e., it is by reason of the assumption of an all-knowing, all-powerful, and benevolent Creator that the question arises how in a world made by him there can be evil. A scientific explanation of the origin of evil is a statement of the conditions of evil, which are on the one hand desiderative beings and on the other a lack of things wanted. The problem of evil thus is at bottom a biological problem. The origin of evil in general as well as that of good will be discovered when the secret of the origin of life is revealed. As opposed to the theoretical problem, is the practical one, how to eliminate evil. This is undertaken in the practical sciences such as ethics, economics, political theory, hygiene, sanitation, eugenics, etc. This problem, it appears, must be solved by specialization.

EVIL, KING'S. See SCROFULA.

EVIL EYE. See MAGIC; SUPERSTITION; WITCHCRAFT.

EVIL-MERODACH, ĕ′vĭl-mē-rō′dăk (the biblical form of the Babylonian *Avel-Marduk*, or *Amel-Marduk*, man of Marduk). A king of Babylonia, the son and successor of Nebuchadnezzar II, who, after a reign of less than a year (561–560 B.C.), was put to death by his brother Neriglissar (i.e., Nergal-shar-usur, "O Nergal! protect the King"). He is referred to in 2 Kings xxv. 27 as having liberated Jehoiachin, King of Judah, in the thirty-seventh year of his captivity. Evil-Merodach's name appears on some contract tablets.

EV′OLUTE AND IN′VOLUTE. The *evolute* of any curve is the locus of the centre of its osculating circle; i.e., of the centre of the curvature (see OSCULATING CIRCLE); and relative to its evolute, the curve is called the *involute*. The following example will show the relation between these curves. If on any curve, as the circle in the figure, a string is closely wrapped, fastened at one end and free at the other, and if the string is unwound from the curve, being kept taut, the curve traced by a pencil fixed to the free end of the string is the involute of that curve from which the string is unwound. The given curve is the evolute of the curve thus traced. This explains the two names. The normal to the involute at any point is a tangent to the evolute, as the construction suggests; and the difference in length between any two radii of curvature to the involute is equal to the length of the arc of the evolute intercepted between them. To Huygens (1673), who was among the first to investigate curves of this kind, is due the name "evolute." He discovered that the evolute of the common cycloid (q.v.) is another cycloid equal to the first. The work in which these discussions occur is Huygens, *Horologium Oscillatorium* (Paris, 1673). See CURVES.



EV′OLU′TION (Lat. *evolutio*, from *evolvere*, to unroll, from *e*, out + *volvere*, to roll; connected with Goth. *walwjan*, AS. *wealwian*, Eng. *wallow*). The evolution theory, in its broadest aspect, undertakes to explain the origin of the universe, of all created things material and immaterial; and more especially the origin of our own planet, together with the plants and animals living and extinct, including man, his physical and mental nature. Applied to living beings, we use the expression "organic evolution," "theory of descent," "origin of species," "transformation of species," or "transformism." The theory of descent is supported by a range of facts as wide as the number and variety of forms of life, the species of plants and animals, living or fossil, entering into the millions. To appreciate properly the facts and arguments on which the theory is based one must be familiar with at least the elements of all the natural sciences, especially botany, zoölogy, and geology, and have done some original work on a group of organisms, besides having some degree of sympathy with the aims and methods of natural science. It should be borne in mind that in this single word *evolution* is comprised a study of the mode of action of that vast complex of natural conditions which has resulted in the formation of the stars and planets, and in the stocking of our earth with plants and animals each after their kind.

Evolution in general is based (1) on the unity of action of the processes of nature. We mean by the word "nature" everything which has been generated, produced, or created. This, from a philosophical standpoint, implies an infinite power, or Creator, outside of and yet immanent in the material world, working by natural laws in and through matter, mind, and spirit. The theory of descent, or organic evolution, is based (2) on the principle of the unity of organization in plants and animals; (3) on the fact that the living substance known as protoplasm is the physical basis of life; (4) on the fact that all movements in the plant or animal body are due to the contractility of protoplasm; and (5) to the fact that all plants and animals arise from germs, seeds, or eggs. This does not exclude the view that the first germ of life—the primitive bit of protoplasm—arose by spontaneous generation.

Definition and Classification of Evolution. As will be seen by the historic summary at the end of this article, attempts have been made since the days of Empedocles and of Aristotle to explain the origin of the universe. The word "evolution" originally was applied to such phenomena as that of the unfolding of a flower or the development of an animal, and was used by Haller, Bonnet, and others, in speaking of the metamorphoses of the butterfly or frog. As a name for what we call evolution, Wolff proposed in 1759 the word "epigenesis" and applied it to the mode of growth and development of the vertebrate embryo. See Epigenesis.

But for the modern use of the word "evolution" we are indebted to Mr. Herbert Spencer. In his *Principles of Biology* (London, ed. of 1900) "the theory of organic evolution first found philosophic, as distinguished from merely scientific, expression." (Osborn.) It would be, perhaps, preferable to say that he used the word both in a philosophic and scientific sense. He gives us this highly generalized definition: "Evolution is an integration of matter and concomitant dissipation of motion, during which the matter passes from a relatively indefinite incoherent homogeneity to a relatively definite coherent heterogeneity, and during which the retained motion (energy) undergoes a parallel transformation." The essence of his view is that there is a continual change in the organic world from the homogeneous to the heterogeneous, or from the generalized to the specialized.

Evolution in general may be divided into (1) inorganic; (2) organic; and (3) mental.

Inorganic Evolution. Under this head may be comprised the evolution of the cosmos or material universe, the evolution of our solar system. It is chiefly concerned with the evolution of our own planet, in the manner described by the framers of the nebular hypothesis. It involves the gradual development of planets from primitive nebulous masses through the different gaseous stages of nebulæ, which have been happily called, by Clodd, "the raw material of which suns and systems are formed."

Planetary evolution has to take into account the formation of the air or atmosphere, of water, and the origin of the denser minerals comprised in the mass of planets.

Chemical evolution then follows. This is the gradual evolution, underlaid and conditioned by the physical forces of matter, from elementary or still simpler conditions, through compounds of various degrees of complexity to the most complex of all, i.e., protoplasm. In this substance physicochemical evolution reached its farthest limits. Since life began inorganic chemistry has gone no further (Le Conte). It is now being recognized that something akin to evolution must have taken place in the elements, since the elementary atoms postulated by the chemist are themselves supposed to be wonderfully complex aggregates of yet smaller particles.

Organic Evolution. As we shall see, this is the theory of descent, or an attempt to account for the origin of organic species. The theory of descent, however—of the origin of species—was the result of attempts after the time of Linné to define and classify plants and animals. Owing to the perplexing variations of the living plants and animals, the difficulty of drawing the limits between the more variable species, the multiplication of specimens in our museums, showing a filiation between many species, though there were wide gaps between others, it became recognized by Lamarck that species were artificial, i.e., ideas; that the individual only was natural or existed in nature, and that the plant and the animal kingdoms should be represented by a genealogical tree, with its stem forms and later derivatives.

As the knowledge of species increased, through the sciences of embryology, morphology, paleontology, and the new light thrown on the earth's history by great advances in geology, a sufficient fullness of knowledge resulted, and almost in a single year (1859) the combined researches of the studies of plant and animal life in different quarters of the globe culminated in the epoch-making theory of descent proposed by Darwin and by Wallace independently of each other, and seconded by Hooker, Fritz Müller, Asa Gray, Huxley, and others.

Under the head of Organic Evolution we have the factors or agencies by which variation has been brought about, giving us the materials on which natural selection acts. The great facts in nature are adaptation and variation, and the causes of morphogenesis, of the origin of types and species, and all the actions of the physical agents, such as light, heat, cold; the chemical changes of the medium in which plants and animals live; changes in the environment, i.e., climate, temperature, altitude, and physiological changes, such as the use and disuse of organs, parasitism, and, finally, heredity. These are called the "primary" factors of evolution, while "natural selection" expresses the results of the action of these primary factors of organic evolution.

Mental Evolution. The actions of animals are physiological or reflex, instinctive, and rational. Man, with his exalted nervous vigor and brain power, alone thinks, reflects, or is self-conscious. It is probable that the more intelligent insects and most of the vertebrates are conscious agents. It is well-nigh impossible in the last analysis to draw the line between the mental acts of animals and man. The germs of reason exist in animals, and the intellectual qualities of man have with little doubt originated from those of the animals, wide as is the gap between the mental, moral, and spiritual nature of man, and the simple, elementary mental faculties of animals.

The result of this mental evolution—the physical evidence of which is seen in the great number of vestigial structures handed down from the higher mammals, in the cranial character of the highest existing races as compared with the fossil races, in his erect position, his culture history, with its progressive steps, from primitive savagery up through barbarism to civilization—shows that at first brain use and development, the exercise of wit, cunning, craft, invention, skill, mastery over the elements, over the beasts, over himself; that high endeavor, the gradual elimination of savage impulses, success in the arts and sciences, due to his social mode of life, and finally a tireless devotion in the highest types of the race to the true, the beautiful, and the good, and appreciation of the divine in human nature, and, finally, the practice and exercise of love to God and to man—that all these have been the agents of his mental evolution, of his moral regeneration, and his devotion to his highest ideals, giving him the promise and potency of existence in another world than that witnessing his physical evolution, where his intellectual and spiritual forces shall have the freest play, unhampered by a struggle for mere animal existence, by competition with baser forces. See BERGSON, HENRI.

Species, Varieties, and Races. The individual is a concrete fact. A species is an induction, a generalization. (See CLASSIFICATION.) Our idea of most species is based on a pair or only a few individuals, whereas the actual number of individuals of most species may be counted by the thousands or even millions. Our conception of a species varies with the number of specimens in our collections; and systematists naturally differ greatly as to the limits of many species. The best definition of species is that of Lamarck: "A species is a collection of similar individuals which are perpetuated by generation in the same condition as long as their environment has not changed sufficiently to bring about variation in their habits, their character, and their forms."

A variety, or subspecies, is a group of individuals breeding true to each other, which resemble each other in color, size, etc., i.e., in characters less pronounced than those of species. Darwin calls a variety an incipient species, or a species in process of formation. Local varieties are fixed variations of species with a wide range; they are restricted to small areas shut in by mountain ranges, etc. They are thus due to different local environments, to differences in temperature, altitude, dryness or moisture, soil, etc. Local varieties, says Wallace, are the first steps in the transition from varieties to species. Varieties are subdivided into "races," though the two terms are often used interchangeably. Huxley calls a race "a propagated variety." Races are subdivided into "breeds," and these into "strains"—the numerous breeds of pigeons, as the fantail, pouter, barb, tumbler, English carrier, etc., are examples of breeds, while a strain is the least recognizable variation from some racial form. Among domestic horses, we speak of the Arabian, Clyde, or Percheron breed; of the Morgan or Hambletonian strains. The American trotting horse is a breed which has been formed by artificial selection since the year 1822.

Sports. Much interest is now felt in the matter of "sports" or aberrations. A sport may be defined as an individual which is born of ordinary parentage, but differs in some marked physical or mental characteristic. Sports in cultivated plants or domestic animals appear without any known cause, whereas aberrations in moths and butterflies are readily produced by artificial changes in temperature, humidity, or dryness. Among animals, the famous Ancon or otter sheep is as remarkable as any. By careful breeding with normal sheep, this long-bodied, crooked-legged sheep became the progenitor of a flock resembling the first aberration. Nature abhors aberrations and by natural selection wipes them out. Yet Galton thinks that the transmutation of species is due to sports, and De Vries upholds the theory of mutation, by which variations from the normal, if useful, are seized upon, and perpetuated by natural selection. With this view we sympathize, for the occurrence, claimed by Darwin, of vast numbers of intermediate forms between what are now "valid" species, is a doctrine difficult to apply to all cases.

Sports may be divided (1) into "teratoid" sports, the result of discontinuous variation, in fact monstrosities, and (2) "biotic" sports, which are due to more or less sudden changes of the conditions of life.

The remarkable experiments of Standfuss show that in lepidoptera the crossing of an aberration with the parent form may often result, not in the production of intermediate types, but in the sharp cleavage of offspring into two groups, each resembling one parent and not the other.

Factors of Organic Evolution. We will now pass on to the mechanism of evolution, the means by which species and genera, and even orders, classes, and phyla, have been evolved. These factors are (1) changes in the environment, and (2) dynamic or physiological, i.e., the result of movement, strains and stresses, due to the exercise of organs.

Effects of Changes in the Cosmical Environment of the Genesis of Life Forms. When the earth was cooling down from a gaseous to a solid condition, it is most probable that the changes in the cosmical environment had an immediate and creative or modifying effect on the beginnings of life. It is certain that the action of the same cosmical agents, such as motion, gravity, electricity, etc., which have determined the spherical shape of the planets, as well as of a drop of water, has been concerned in determining the shapes of cells, of eggs, of the simplest organisms, and is the basis of all physiological phenomena as well as of motion in animals.

Plant and animal life are influenced in a way we do not understand by electricity; they are also influenced by variations in the pressure of the air. Jaeger claims that the force of gravitation is the primitive morphogenetic factor in the development of animals. In the growth of plants the influence of gravity and light is marked. The influence of gravity on the form of shells is noticeable. To this has been, by Hyatt, attributed the asymmetry of univalve shells.

The mechanical state of the medium is important in modifying the shape of animals. The spindle-shaped body of fishes enables them to cleave the water; so it is with the shapes of winged animals, whether insects, birds, or pterodactyls. When some terrestrial mammal was driven by necessity or competition with its fellows to seek a livelihood in the sea, and thus gave origin to the order of whales, its body underwent a transformation; it became fishlike in shape, and while from disuse it lost its hind limbs, the forelegs were converted into fins.

When animals of very different types, such as the earthworm, many sea worms, multitudes of parasitic worms, the boring larvæ of insects, live in a denser medium than water and have been obliged to burrow in the soil, or in the dense tissues of their hosts, the body tends to become elongated, cylindrical, and pointed at each end.

Effects of Changes in the Chemical Nature of the Medium. Every one is aware how rapidly most sea animals, all except the migratory fishes, such as salmon, die when placed in fresh water. The effect of living by the sea on land plants is to thicken their leaves. The palisade cells are more numerous and larger than in leaves of the same plants when grown inland. Apparently the sea salt is the cause of this alteration, as plants cultivated in an artificially salted soil yield thicker leaves. Such a change as this is the result of the direct action of a changed environment.

The effect of a change from fresh to salt water on delicate forms, like the phyllopod crustaceans (*Branchipus*, etc.), is to dwarf them. Thus, the little brine shrimp (q.v.) is apparently a dwarfed and otherwise modified form of some fresh-water ancestor.

Experiments have shown that the brine shrimp varies greatly with differences in the density of the water in which it lives, with the result that here we have a transformation of one species into another. One form living in strong brine has a longer abdomen than others living in a weaker solution. This has been observed in nature and also in forms living in the laboratory.

The lakes near the Sea of Aral are known to vary in degree of saltness at different seasons of the year; the result of this change from saline to comparatively fresh water causes marked variation in the pond snails, so much so that the extreme varieties might be regarded as distinct species. So with the cockleshells; the semifossil ones on the borders of lakes which once formed a part of the Aral Sea vary greatly.

Effects of Changes of Light. Our light comes from the sun. Without sunlight there would be no life. Were it not for the stimulus of the sun's rays, animals would be eyeless; and it is the absence of light which bleaches animals living in darkness, preventing the formation and development of the pigment in the skin. On the other hand, the colors of animals, the beautiful and varied tints of butterflies and birds, of tropical shells as well as the gorgeous hues of flowers, are all due to the stimulating effects of light.

Light is necessary for the development of chlorophyll, and therefore is an indispensable agent in the life of all green plants, and especially for tree life and wood formation. Sachs observes that "the forms and modes of life presented by plants . . . must have been to a large extent induced by the continued action of gravitation and light." And this applies as a general statement to the simple animals and in a sense to all animal life.

The influence of changes in the environment, and especially of light, on organisms may be immediate and direct, or it may be indirect. The French botanist Bonnier has shown by experiments that a life in feeble light produces a change in the structure of plants, and that if placed in markedly different surroundings they either perish or become rapidly modified to meet the changed conditions. He has found that Arctic plants differ noticeably from the same species growing in Alpine regions in the greater thickness and simpler structure of the leaves and has attributed this to the feeble light of the Arctic region and to the greater degree of moisture. By means of feeble electric lighting and a moist, cool temperature he had in his laboratory in Paris produced these differences, i.e., converted Alpine into Arctic plants.

Phototaxis. This means the influence of light in directing the movements of freely moving cells or unicellular plants, as certain bacteria. "Heliotropism" means a turning to the light, as seen in the case of infusoria, and many higher animals which will in an aquarium press to the light and collect on the side of the vessel next to the light. The influence of light on night-flying moths and other insects is well known. See TROPISM.

Color Preference. Different animals have a marked preference for certain colors of the spectrum, in which they seem to feel better. The little crustacean *Daphnia* prefers to swim in orange, yellow, and especially in green light. The starfish shuns the red rays. Animals which love light, such as bees, prefer blue or green, while the light-shunning forms, such as ants, have less antipathy for red than for other colors. In these cases light doubtless acts as an excitant on respiration. It has been observed that slugs almost always move with reference to certain external agents, as gravity and strong light; they move in straight lines vertically either from or towards the light. It is so also with the *Hydra*, and starfish, as well as with the larvæ of certain starfish.

Colors of Animals Influenced by Light. It is well known that the chameleon and the Floridan *Anolis* lizard, as well as tree toads, rapidly change their color from green to gray or brown, according as they rest among green leaves or on the trunk or branches of trees. The "chromatic function" is that adaptation of the color of the skin of these animals, as well as of squids, crustaceans, etc., to that of their surroundings. This is due to the contraction or expansion of the pigment cells (chromatophores) in the skin. The pigment differs in color in different individuals and species, and in different parts of the body, being yellow, brown, black, sometimes even red or green. On their distribution and their alternate expansion and contraction under the influence of the nervous system depends the pattern which the frog's skin displays at any given moment.

It is claimed by Biedemann that the color cells change their shape as the result of the direct action of light and temperature. It appears that the slightest change of temperature affects the mutual disposition of the pigment cells, and consequently the color, of the frog. Keeping the animal in the hand is enough to provoke a contraction of the black cells.

That the light acts as a direct stimulus has been proved by Steinach, who glued strips of black paper to the skin of frogs which were kept in the dark; when they were exposed to the light only the uncovered parts of their skin became paler, while the covered parts remained dark. To avoid all doubt, the experiments were repeated on skin separated from the body, and photograms of letters and flowers, cut out of black paper and glued to the skin, were reproduced upon it. Besides, blind tree frogs do not become darker, as fishes do; and Biedemann has proved that the chief agency of their changes of color is not in the sensations derived from the eye, but in those derived from the skin.

The action of light also causes the varied hues and markings of the chrysalids of butterflies. During the semipupal state, before the chrysalis is fully formed, the surface is, so to speak, photographically sensitive to the color of the surroundings, and the gay hues of such pupæ are due to exposure to the surroundings. Thus, Poulton found that where the pupæ transformed in boxes, lined with black paper, they became dark, while white light produced pale ones, many of the last being brilliantly golden; this suggested gilt surroundings, which were far more efficient than white in producing chrysalids of a distinctly golden color, and even of a deeper hue than often occurs in nature.

The under side of flounders and other flatfish, as is well known, is white, owing to the absence of pigment, while the upper side of the body is dark, or variously spotted, or eyed. When the under side is dark, the fish will be found, according to Pouchet, to be blind.

By experiments in severing the connection of some of the spinal nerves with the sympathetic nerves of the same side, Pouchet succeeded in limiting the chromatic function to those spots where the nerves remained in connection with the sympathetic; and he was thus able to produce at pleasure a zebra-like marking on one side of a fish, while the other side retained its natural hues and their normal variation, according to the colors reflected from surrounding objects.

It is well known that small flounders and various kinds of shrimps will turn pale if placed in a white dish of salt water, and the red, green, and brown colors of shrimps and other crustaceans will change in a few hours in color to correspond with the green, red, or brown seaweeds in which they rest. This was carefully observed in the case of the prawn by Herdman, who also kept a number of specimens of different colors under observation in jars with various colors of seaweeds and of background and in very different degrees of light. The results showed that the adult animal can change its coloring very thoroughly, though not in a very short space of time. The change is due to alterations in the size and arrangement of the pigment granules of the chromatophores.

It will be seen from these facts that the wonderful hues of tropical fish, with their colored bands, the stripes of snakes, or of the tiger, the spots of the leopard, the gay markings of caterpillars and of butterflies, as well as of spiders, are originally due to changes in light and shade. This will also apply to many of the protective markings of insects and other animals; the initial cause or factor is the varying action of the sun's light, though natural selection may act as a secondary factor, those forms or varieties most protected by their special style of coloration surviving.

Effects of Darkness. On the other hand, the absence of light, or a life in perpetual darkness, has gravely modified the visual organs of cave animals and those living in the abysses of the sea. (See CAVE ANIMALS.) In the case of the blind beetles, crawfish, spiders, myriapods, etc., of caverns, we have the most obvious facts showing the direct action of the environment. The members of the fauna of our caves have their eyes variously affected; some are blind, others have vestiges of eyes, and others are completely eyeless. The cause is simply the result of disuse, for natural selection does not operate in such cases. The loss of eyesight and the scanty food render the body slender, pale, colorless, while, in compensation for the loss of sight, the tactile sense is greatly exalted; the antennæ, legs, and other appendages are remarkably long and slender compared with those of their out-of-doors relatives. The whole subject of cave life affords a most instructive example of the effects of the absence of light, the disuse of organs and their different degrees of atrophy, and other remarkable modifications of the body, and of use inheritance, all brought about by the action of the primary factors of evolution, without the intervention of natural selection. It is proper to say, however, that Weissmann and other ardent Darwinians account for the facts by natural selection.

Other animals live in holes in the sea bottom, as some blind crustaceans and fishes, whose eyes in the very young are normal, also towards or at maturity become blind, and perhaps eyeless. The blind fishes and crustaceans of the deep sea afford similar instances. It is a significant fact that those animals, notably the fishes, are provided with phosphorescent organs.

Effects of Changes of Temperature. If a life in total darkness causes great variation and the origin of new forms adapted to strange conditions, so also great changes in temperature, as shown in nature and by laboratory experiments, afford the strongest circumstantial evidence of the origin of new species by changes in the condition of life. It should be observed that variations due to changes of temperature are not fortuitous, but in direct relation to such changes of environment.

There is for each individual, and hence for each species, an optimum temperature which is most favorable to its welfare and most favors nutrition and hence growth and multiplication. On the other hand, extremes of cold (minimum) and of heat (maximum) are unfavorable and tend to cause death. Cold and its equivalent, altitude, tends to dwarf plants, shells, etc. When pond snails are transported into a cold region, where the temperature is below the optimum, sexual maturity is reached before the animal has attained its full growth, and there is thus formed a dwarf race by simple change of climate. Hence this is the reason why Alpine and Arctic species are of very small size compared with those of lowlands in the temperate zone.

Certain plants, mollusks, crustaceans, etc., may become adapted to hot springs, constituting a thermal-spring fauna. Several kinds of mollusks live and prosper in the thermal waters of the Pyrenees, and of Dax, whose temperature varies from 25° to 35° C. (76° to 94° F.). A gastropod (*Melania tuberculata*) lives in the hot springs of Algeria in a temperature of 87° F., and a beetle (*Hydrobius orbicularis*) in the hot springs of Hammam-Meskoutine, with a temperature of 55° C. (130° F.); in cooler portions of the heated stream live a little fish, and the fresh-water crab (*Telphusa fluviatilis*). A small mollusk supports a heat of 122° F. in Italy, and another (*Neritina thermophila*) occurs in a hot spring in New Ireland, with a temperature of 122° and 140° F.

Finally, the supportable maximum appears to be confined between 105° and 113° F. It is known that at 122° F. protoplasm, at least in vertebrate animals, partially coagulates, and this causes death as by sunstroke, though Rotifera may withstand even 80° C., while Protista live in hot springs far above 60° C., and green algæ can survive 70° C. Yet, as we shall see further on, monads can be so modified by a gradual elevation of the temperature as to withstand the extreme of 158° F.

Very striking experiments have recently shown that varieties and species may be artificially produced by variations of temperature, which in some cases are like those in nature. This is as near an actual demonstration of the evolution of species as we can expect to reach. Mr. Wallace remarks that we have never seen a new species formed by natural selection; but in these temperature varieties we see how species have arisen by the direct action of a change in the environment.

Sudden changes cause death, but if the change is slow and gradual the animal may become adapted to or acclimatized in a temperature relatively high. By thus raising the temperature Dallinger practically produced a new temperature race or variety of infusorian (Heteromita). For a period of over 10 years he made observations on this infusorian. Observing that a new generation comes into existence every four minutes or so, it took years of experimentation to raise the temperature to 158° F. Beginning with the normal temperature of the water at 60° F., in four months he had raised it to 70°, without, however, affecting the monads, which continued to multiply by fission as vigorously as before. When 73° was reached, however, an adverse influence seemed to be excited on the organisms as regards their vitality and productiveness; but by keeping the temperature constant for two months the new generations became, so to speak, acclimatized, and in five months more the temperature was gradually raised to 78°. These experiments were continued until the temperature of 158° F. was reached, when an accident put an end to the experiments, and the new race thus adapted became extinct.

Another instance of the effects of changes in temperature is the case of a pond snail (*Physa acuta*) which lived in the water of an artesian well with a temperature of 32° to 33° C. (c.90° F.); they were dwarfed and frequently deformed, but they reverted to their normal size when, owing to the diminution of the supply, the water became cooled at the end of two years. Owing to the great summer heat (104° F.) in the Transcaspian oasis, birds molt in summer. Dolbear states that the rate of the chirp of the cricket is entirely determined by the temperature; at 60° F. the frequency is 80 times a minute, and at 70° it chirps 120 times a minute.

Wasmann was able during three successive winters to induce parthenogenesis in the workers of an ant (*Formica sanguinea*), and in their helpers or slaves, by artificially warming the nests. On one day as many as 12 workers of this ant were seen laying eggs. Most of them were large workers, but small ones were also affected, and the smaller the ant the more tedious was the process of egg laying. Of many hundreds of eggs thus laid none attained full development, as the eggs or larvæ were all devoured by the ants. Many mollusks common in France become in Africa (Algeria) doubled in size, while *Bulimus decollatus* becomes even nine times larger than in Europe.

On the other hand, cold is an efficient agent in modifying plants and animals. It is well known that fishes, caterpillars, etc., can be frozen, and, if gradually thawed out, become again active. One of the cabbage butterflies (*Pieris brassicæ*) may live through —20° C., and the European garden snail (*Helix pomatia*) survives refrigeration to —130° C., the lowest temperature which could be obtained (Yung). As is well known, the cold of highlands and of mountains, as well as an extreme northern climate, dwarfs man and animals as well as plants, while the proportions of the body are also changed. Salamanders, like the axolotl of Mexico, and the siredon of Lake Como, Wyo., under the influence of the elevation and low temperature, become retarded in their development; while the reproductive organs become accelerated in development and they breed while in the larval state. Parthenogenesis in aphids ceases at the approach of the autumnal cold.

Effects of Change of Climate. This has a much greater effect on the origination of varieties and species than is generally supposed. It was formerly the fashion to claim that climate had little or nothing to do with the origination of species. It is not improbable, however, that nearly a third or a half of the species in museums, or of those described in biological literature, are climatic or local varieties or species. The study of variation as now carried on, by measurements of great numbers of specimens, shows that each region, however limited, has its local race or breed, each of which differs from the others in slight yet constant features. And on general principles it is a change in the conditions of life, however slight, which reacts on the organism and results in adaptation to the environment.

Local varieties are usually restricted to small circumscribed areas, separated by mountains, or by altitude, or by moist or dry regions; or, if marine, by different kinds of bottom, whether sandy, muddy, or rocky, or by different degrees of saltness of the water.

In the fresh-water fishes of the Pacific slope each locality has its peculiar variety, which in the aggregate is different from the variety of every other locality (Gilbert and Evermann). These variations are due to the different environment, for the differences in temperature, altitude, and topography in the course of the different streams which take their rise in the Sierra Nevada are very marked. Indeed, whether we consider the insects, fishes, birds, or mammals in such a region as the Pacific coast, which is undergoing rapid erosion or base-leveling, the number of local species and sub-species, is remarkable. Packard has observed that species of moths which do not vary much on the Atlantic coast, where the topographical conditions are more stable, are in California exposed to very considerable variation.

Even in two neighboring lakes in Indiana (Lakes Turkey and Tippecanoe) the individuals of a darter (*Etheostoma capsodes*) from one lake differ constantly from those of the other lake in color, in the scales of the nape, and of the lateral line, in the number of spines in the anal fin, in the number of dorsal spines and rays. (Moenkhaus.) Similar instances are the absence of ventral fins in some of the fishes inhabiting even widely separated mountain lakes, and the presence of enlarged scales along the base of the anal fin in the cyprinoid fishes inhabiting the mountain streams of India, also the peculiar color patterns of the fishes in certain portions of northern Georgia. See ISOLATION.

Introduced species tend to vary much more than in their native lands. Children born of British, German, or French parentage become in the United States slightly taller than their parents; the soldiers of the United States army during the Civil War of 1861–65 were found, by measurements made on 1,110,000 individuals, to average taller than those of the British army.

Dr. Bumpus has critically examined and measured over 1700 eggs of the English sparrow, one-half from England and the other half collected at Providence, R. I. He found that the eggs of the new or American race or breed vary much more than the European, differing in being smaller and of a strikingly different shape, being more rounded and with a greater amount of color variation. His measurements of the European periwinkle (*Littorina littorea*), 3000 from England and 3000 from New England, afforded similar results. Since its introduction, about 1855, into the Bay of Chaleurs and its rapid spread along the coast to New York, this little mollusk has undergone a transformation adapting it to the different conditions of our northeastern coast. It has become more elongated, lighter in weight, more bulky, and the color markings are less pronounced. Also large collections, in some cases 1000, from Casco Bay, Woods Hole, Seaconnet, Newport, and Bristol, were found to present constant variations at each locality, the curves of variation exhibited on the charts prepared by Dr. Bumpus being different for each locality. So it is with a European land snail (*Helix memoralis*) introduced within a few years into Lexington, Va. In Europe this is an exceedingly variable species, but already of the 125 Virginian varieties found by Mr. Cockerell, 67 are new and unknown in Europe.

But by far the strongest and clearest evidence of the means by which species are originated are afforded by Dr. J. A. Allen in the case of our American birds and mammals, his results having been based on prolonged studies made upon a vast number of specimens from different localities. Our birds are found in passing from the Atlantic to the Pacific coast to vary in general size, in the size of the peripheral parts (wings, etc.), and in color, thus varying with latitude or longitude. There is an increase in size from the south northward, not only in individuals, but generally, though there are some exceptions. The largest species of each genus and family are northern, as in the cases of the fox and wolf, the latter being one-fifth larger in Alaska than are southern species of their kind. In the case of those birds which breed from New England to Florida, the southern ones are smaller and differ in color. Mammals and birds, in their southerly examples, have larger ears and feet, and the cattle have larger horns. The hares have less furry ears and naked soles; the sagebrush hare has longer ears southward; so with the large long-eared "jack rabbit." In birds bill, claws, and tail are larger in southern species, and all the largest-billed birds live in the tropics. This, however, is to be observed in sparrows, blackbirds, crows, thrushes, wrens, and warblers, in the quail, meadowlark, and flicker. In Florida forms with slender bills common to that State and to the North have beaks still more slender, longer, and decurved. Those with a short conical bill have thicker and longer bills than their northern relatives, though the birds themselves are smaller. It is so with the tail—the size of the body is the same as in the North, while the tail is proportionately larger and longer.

The color in mammals, as the red squirrel, changes in going southward from pale yellow or fulvous to rufous. Except three species, all squirrels living north of Mexico have the lower parts of the body white, while those inhabiting tropical Mexico have the lower parts fulvous, deep golden, orange, or even dark brownish red. In birds the colors are so much stronger and darker in southern forms that they might with their smaller size and larger bills be regarded as distinct species. The blue jay, cardinal, and other birds have, in the South, a more brilliant and intense hue; some species are mere black and red. In crossing from the Atlantic to the Pacific coast Allen observes that there are three phases of color. On the Atlantic coast the birds are bright and strongly colored; on the great plains they are pallid, owing to the dryness; and on the humid, heavily wooded Pacific coast the hues are deep-colored or piceous, both in birds and mammals.

The same obtains in the Old World. The marsh tit of Europe in warm, rainy regions has its browns intensified; in dry, sandy districts the plumage is paler; in the Arctic regions it varies in paleness, and in Kamchatka it is almost white (Dixon). The birds of the Galápagos Islands differ from their nearest allies of the South American mainland in their larger bills, shorter wings, longer tails, and darker colors. Besides this each of these islands has its local species or varieties, which do not pass from one island to the others.

The most important direct experimental evidence of the effect of humidity on color is Beebe's work on doves (*Zoologica*, I, No. 1, New York

Zoölogical Society), where in successive molts differences were obtained which would be of full specific value in nature.

Many other examples could be given, but enough has been stated to prove that in the past, as well as at present, changes in climate have had an all-powerful influence in the origination of species. To this factor, together with migration and geographical isolation, we may attribute a very large proportion of the known species of plant and animal life and also the races of mankind.

Seasonal Dimorphism. Ordinary sexual dimorphism is where there are two forms of one sex, the cause of such a modification being unknown. In seasonal dimorphism, however, the cause is due to changes of temperature. Thus, by subjecting the chrysalids of lowland butterflies to prolonged cold in ice chests Weismann proved that northern or Alpine species are climatic or seasonal varieties. W. H. Edwards has shown that two of the four polymorphic forms of *Papilio ajax* (i.e., *walshii* and *telamonides*) emerge from winter chrysalids, and *Papilio marcellus* emerges from a second brood of summer chrysalids.

Cases of seasonal dimorphism frequently occur among tropical butterflies. While in the north or temperate zone we have winter and summer forms, in the tropics of India and of Africa there are wet-season and dry-season forms. It is curious that the difference between the two forms principally consists in the fact that one looks on the underside like a dry leaf, while the other is marked with eyelike spots, or ocelli. Their identity has been proved by raising both forms from the same batch of eggs. This case appears to be due to the direct action of the season—in the dry form to dryness and heat, in the wet form to the moisture and coolness of the wet season. Weismann, however, maintains that these changes of climate or season are "only the stimulus, not the actual causes," the latter being the processes of selection—a quite hypothetical cause, although 20 years ago he attributed the change to the effect of change of temperature. Limitations of space forbid one enlarging on this fascinating theme, but we may briefly refer to the remarkable experiments of Standfuss, who, by subjecting pupæ of Swiss butterflies to heat or cold, has produced artificially true temperature varieties, as follows: (1) seasonal forms, similar to those known in nature (*Vanessa cardui albus*, and *Papilio machaon* to some extent); (2) local forms and races similar to those which occur constantly in certain localities (*Vanessa urticæ, cardui*, and to some extent *Papilio machaon* and *Vanessa antiopa*); (3) entirely exceptional forms or aberrations, also occurring from time to time in nature (*Vanessa io, cardui; Argynnis aglaia*); (4) phylogenetic forms, not now existing, "but which may either have existed in past epochs or may perhaps be destined to arise in the future" (*Vanessa io, antiopa, atalanta*). The conclusion from this and experiments by others shows, as Standfuss claims, that such forms are the result of the direct action of a change in the temperature.

Effects of Change of Food. While changes of light, heat or cold, moisture and dryness, are fundamental factors in causing variation, the abundance or scarcity and the nature of the food are an equally potent agency, not only affecting growth and reproduction, but in producing variation and, by causing a change in habits, in bringing about profound modifications of the body. We will begin with the simplest organisms. Maupas believes that the reproductive power of ciliate infusoria depends (1) on the quality and quantity of food, (2) on the temperature, and (3) on the alimentary adaptation of the buccal organ. With favorable nutrition an infusorian (*Stylonichia pustulata*) undergoes self division once in 24 hours at a temperature of 7° to 10° C. (42° to 50° F.), twice at 10° to 15° C. (50° to 60° F.), thrice at 15° to 20° C. (60° to 69° F.), four times at 20° to 24° C. (69° to 76° F.), and five times at 24° to 27° C. (76° to 80° F.). Thus, at a temperature of from 25° to 26° C. (76° to 80° F.), a single *Stylonichia* would in 7½ days have a progeny of 100,000,000,000, estimated to weigh 100 kilograms (about 230 pounds). With a vegetable diet the rate is much less and the size smaller. Maupas also shows that infusoria continue to multiply by fission until the supply of food fails, when hunger leads them to conjugate.

Polymorphism. It now appears that the polymorphism of the social insects is due to the nature and amount of food. The existence of worker ants and bees, whose characteristics are not inherited from their parents, has been a stumbling-block to the theory of descent. As Darwin states it: "The difficulty lies in understanding how such correlated modifications of structure could have been slowly accumulated by natural selection"; the "acme of the difficulty" being "the fact that the neuters of several ants differ, not only from the fertile females and males, but from each other, sometimes to an almost incredible degree, and are thus divided into two or even three castes." The castes, moreover, do not commonly graduate into each other, but are perfectly well defined; being as distinct from each other as are any two species of the same genus, or rather as any two genera of the same family. It has also been found by Wheeler that in a Texan ant the several castes are at first all alike, the remarkable differences between the large and small-headed workers being due to differences in the amount and nature of the food.

It is well known that the larvæ of the worker honeybees are fed with much less nutritious food than those of the queens, which are fed on "pap," or "bee milk," a highly nitrogenous food which has apparently a singular power of developing the reproductive glands. The white ants (Termitidæ) are remarkable for the polymorphism of the species, there being in one kind eight castes, among them workers with small heads and others with large heads, and soldiers of two castes, i.e., small-headed and large-headed. It has been found by Grassi that all these castes are born alike, and that the differences between the castes are chiefly due to the varying nature of the food and have nothing to do with heredity. The small-headed forms have a scanty diet, live on refuse matter, and even eat their own excrement, this being used in the construction of their galleries. The soldiers live on sick or disabled companions. The young are fed only with saliva. From these facts it appears that the amount and nature of the food are the chief cause of the wonderful differentiation of the castes of the social insects; besides this there are the results of the division of labor in the community, use and disuse, together with specialization of labor, arising from the varied life of the populous colony.

Difference in the amount and nature of the food, involving low or under and high feeding, results in a discrepancy in the number of individuals of either sex.

It is now clear that a preponderance in the number of females is the result of high or better feeding. Yung experimented on tadpoles and increased the proportion of females as the diet was improved. In the first brood, by feeding one set with beef, the percentage of females rose from 54 to 78; in the second set, fed with fish, it rose from 61 to 81; while in the third lot, when the especially nutritious flesh of frogs was supplied, the percentage rose from 56 to 92; i.e., in the last case the result of high feeding was that there were 92 females to 8 males.

The result of Düsing's experiments with sheep leaves little doubt that abundant moisture and food tend to the production of females, while high temperature produces males. The heavier well-fed ewes brought forth ewes, while the lighter, underfed ewes gave birth to males. Giron divided a flock of 300 ewes into two equal parts, of which one-half were extremely well fed and served by two young rams, while the others were served by two mature rams and kept poorly fed. The proportion of ewe lambs was 60 per cent and 40 per cent respectively.

Use and Disuse as Factors. Thus far we have considered the action of those factors which are concerned rather with the origination of varieties and species than of higher types; with the causes of specific variation rather than of the formation of genera, families, orders, classes, and branches, or phyla. While gravity, light, and the allied factors evidently come into play in morphogenesis, the inquiry arises how the higher categories of organic forms originated. This must mainly have been accomplished through change of environment, inducing new needs, the formation of new habits, or change of function, all operating together and resulting in adaptations to the new mode of life. In all this the principle of use and disuse plays a most important part. See DISUSE.

New Structures. An interesting example of the origin of a new structure due to change in habits and to resulting strains and movements is the formation of bivalve shells in animals of classes so unlike as the bivalve mollusks (Pelecypoda) and the ostracod, phyllopod, and phyllocaridan crustaceans. The shell, or carapace, has become folded into two valves to protect the body. The valves are opened and closed by the relaxation or contraction of one or two peculiar muscles, the adductors. These muscles are not homologous with any muscles in other classes, and at least in bivalve mollusks they are probably developed from the mantle muscle as a consequence of the conditions of the case. The several types thus occurring in different branches, or phyla, "is a strong proof that common forces acting on all alike have induced the resulting form." (Jackson.) There are also good examples of mimicry or "convergence," and many so-called cases of mimicry are undoubtedly merely examples of such convergence or similarity of form due to the subjection of animals of quite different groups to identical habits or conditions.

Now, as the order of Crustacea is founded in part on the nature of the carapace or of the limbs, whether adapted for walking, swimming, or biting, etc., the ordinal characters are evidently due to the different uses to which these parts are adapted. It is so with the classes of mollusks; the bivalves are secondary forms which by change of habits gradually evolved from some wormlike ancestor. The gastropods, with their unsymmetrical shells, and the creeping or swimming cephalopods, with their closely coiled shells (when a shell is present), are clearly the result of the use of certain parts, the disuse of others. So it is with the orders of mammals and birds, and the form of man is mainly due to the disuse of his feet in climbing, to his erect position, and to the use and exercise of his brain.

Coöperative Evidences of Evolution. That the general theory of evolution represents the truth of history and existing facts is supported by evidence from all departments of biology. The basis of morphology is anatomy and embryology. As soon as anatomists studied the mode of development of organs and traced their history from the germ, it was found that organs of the most diverse shape and use had had a common origin. Thus, the arm of man, the foreleg of the lion, the flipper of the seal, the paddle of the whale, and a fish's fin were found to be morphologically identical—the same in origin and fundamental structure—while the wings of a bird and an insect were perceived to be simply analogous. Thus, what seemed the most diverse organs were found to have a common origin. Also cell studies proved that the cell is the unit of organic life.

Classification also yields evidence. It is now recognized that the plant and animal kingdoms may each be represented by a genealogical tree; that the members of different classes, orders, families, genera, species, and varieties are blood relations which have had a common descent from some primitive form, and that ultimately the vegetable and animal kingdoms have descended from a common ancestor. Taxonomy is an attempt to unravel these lines of descent. In classifying animals of any group (see CLASSIFICATION) we are constructing a phylogeny, or genealogical tree.

Embryology furnishes an argument. The mode of development of an animal throws light on its affinities. Thus, the barnacle (q.v.) was supposed to be a mollusk until its development from a nauplius young, very similar to that of certain crustacea, proved that it is a member of that class. Mere resemblance between the young of members of different classes points unerringly to their common origin. Embryology (q.v.) teaches that all plants and animals have originated from a one-celled form. At one stage the fish, amphibian, reptile, bird, mammal, and even man are indistinguishable from each other, and the resemblance of the early embryo points to the origin of all vertebrates from some wormlike form. From his studies on the embryology of vertebrates, Von Baer first indicated the "recapitulation theory" —i.e., that the different stages of development of a highly specialized animal constitute an epitome or recapitulation of that of the class or type to which it belongs.

As stated by Von Baer, and afterward more fully by Agassiz, the law expresses a general fact. It was Fritz Müller who, in 1864, explicitly pointed out its evolutional or phylogenetic bearings, and in 1866 Haeckel restated the doctrine in the following words: "The developmental history (ontogeny) of an individual animal briefly recapitulates the history of the race (phylogeny)—i.e., the most important stages of organization which its ancestors have passed through appear again, even if somewhat modified in the development of individual animals."

Thanks to recent advances in morphology and embryology, and particularly to the study of vestigial structures, we are in a position to work out the phylogeny of the animal kingdom, or any group of it, with some approximation to exactitude. Even within the limits of a genus it is in some cases possible to detect vestiges of what were primitive characters and thus to arrange in genealogical order the different species. It is this sort of work which gives new life, dignity, and importance to classification.

Vestigial Structures. The study of vestigial characters in highly specialized animals gives the clew to their ancestry. Thus, man has in his body about 70 vestigial structures which appear to be of no use to him; some, as the cæcal appendage (see VERMIFORM APPENDIX), a positive menace; and all these afford the strongest possible circumstantial evidence of his descent from an arboreal ancestor.

The study of the changes undergone by animals like the frog or butterfly after birth, or what we call "metamorphosis," is rich also in facts and suggestions which tend to prove that such wonderful changes are due to the action of the primary factors of organic evolution. It is so also with the hypermetamorphosis of certain insects. On the other hand, in groups of animals which normally undergo a metamorphosis, development may, with a changed environment, be direct or abridged. It is so with the lobster, certain crabs, some insects, and especially some of the tree toads of the West Indies and of South America. As examples, a Guadeloupe species of *Hylodes* (q.v.) is hatched in the form of the adult; since there are no marshes on the island, the tadpole state is suppressed, or passed through in an abbreviated way in the embryo. On the island of Martinique the young are tadpoles, but they are carried on the parent's back. The Surinam toad (*Pipa*) has similar breeding habits, yet the young have small gills, which, however, are of no use to them, as the tadpoles do not enter the water, but are carried about in cavities on the back, where the young pass through an abridged metamorphosis.

We have also seen that parthenogenesis (q.v.) is due to differences in temperature and food, while the alternation of generations (q.v.) of the hydroids is directly conditioned by the environment.

Geological Evidence. The age of the earth is approximately estimated to be about 50,000,000 years. Its history is divided by geologists into ages, periods, epochs, etc. It is roughly estimated that about 30,000,000 years have elapsed since the deposition of the lowest fossiliferous rocks—those of Cambrian age. It is believed that this amount of time is sufficient for the origin and development of all the forms of life with which we are thus far acquainted. The stratified rocks are supposed to be about 20 miles thick, the earth's crust about 100 miles in average thickness.

During the enormous space of time since the Cambrian the forces of life and nature have gone on much as at the present time, although the oceans and land masses down to the Glacial period practically had a subtropical climate. Yet there were revolutions, widespread changes of level in the relative distribution of land and water, so that the map of the world changed greatly at different periods. Hence there must have been successive changes of environment, the conditions of existence were unstable, there were vast migrations, and the founding of new colonies in regions opened up to migration resulting from the subsidence of one region and the elevation of another. Plateaus were elevated, mountain ranges formed, mountain peaks carved out of the mass of folded strata, and thus the entire plateau was finally worn down by the action of the rain and of rivers until the surface formed a peneplain. Such a history of topographical transformation occurred more than once on both the Atlantic and the Pacific coasts of the American continent. All these changes, these revolutions, such as the Appalachian and those of the Glacial period, exerted a profound influence on the flora and fauna. The great lesson of geology is the immensity of time and the ceaseless changes which have taken place in the physical geography of our globe; and these are of prime importance as respects the evolution of life on its surface and the variation of life forms; and yet there were long periods of rest, succeeded by local catastrophes and upheavals, though these so-called "catastrophes,' however sudden geologically, may have extended through thousands of years. The breaks, as indicated by local unconformities in the strata of different ages, were confined to comparatively limited areas. So that periods of what we call rapid extinction of life were also periods of the comparatively rapid evolution and specialization of plants and animals.

The changes of level, the great elevation of the land in the Northern and Southern hemispheres, the widespread and profound change of climate which ushered in the Glacial period, and the effect which the geologically sudden lowering of the climate had on plant and animal life, causing extensive migrations and adaptations (as of the polar plants and animals) to their frigid environment, afford signal examples of the effect of geological changes on the extinction of some and the modification of other forms. So also the enormous changes of level which occurred in Mesozoic and Tertiary times, when vast regions of the globe were carried up into the air, so to speak, and the climate changed from a tropical one to that of an elevated, cooler region. The very last changes of level which took place after the melting of the ice sheet, the drainage of continents, and the formation of extensive deserts, accompanied by the adaptation of much plant and animal life to them, should also be taken into account as producing variation.

Evidence from Paleontology. Huxley affirmed that the primary and direct evidence in favor of evolution can be furnished only by paleontology, and its evidence is, indeed, of the strongest nature, the discoveries and conclusions of paleontologists adding each year to the strength of the argument.

There are remains in the Cambrian rocks of 14 classes of marine invertebrate animals and traces of primitive plants. The Cambrian annelids, trilobites, crustaceans, and other class forms are highly developed. Some, as the trilobites, are old-fashioned, generalized types; some of the crustacea are composite or generalized types, as the Phyllocarida; but the annelids are as highly specialized as their representatives of to-day. The earliest trilobites (q.v.) were blind or eyeless, though they may have descended from eyed forms. These and other facts strongly indicate that the Precambrian, including the Huronian, and possibly the Upper Laurentian ocean, supported an abundant life, made up of protozoans, sponges, and the ancestors of worms, mollusks, arthropods, etc., and most probably of the vertebrates. The Precambrian time was a period of the rapid evolution of types; stratigraphic geology shows that in this formative period there were widespread and rapid changes in the physical geography of the globe.

Another period of the apparently rapid evolution of life forms was the time of the Appalachian revolution, when vertebrates with lungs and limbs appeared, and the forerunners of reptiles, birds, and mammals probably originated. In these early times the Precambrian, as well as the opening ages of the Mesozoic, animal types were more plastic than now; dynamic evolution and use inheritance did their work in the origination of class and ordinal types with comparative suddenness.

Paleontology teaches the fact of the rise, culmination, and death of types; the origin of life from generalized forms and their gradual modification and specialization. It is safe to say that the ancestral forms of most, if not all, the classes of animals began with composite or synthetic types. The geological succession of the arthropod classes, as well as those of the vertebrate phylum, all tell the same story. What morphology and embryology strongly suggest is emphatically confirmed by the series of fossil remains. The origin of reptiles, of birds, of mammals, and of man from generalized types is now placed beyond a reasonable doubt. Familiar examples of those principles or laws of organic evolution are afforded by the genealogy of the horse family (see HORSE, FOSSIL; CAMELIDÆ; ETC.), the ox, deer, cat, and other families and orders of vertebrates. And so it is with the phyla into which the arthropods will have to be divided. There are lines of development which have undergone a continual course of modification by the rapid development by exercise of the brain, limbs, and teeth, and the reduction or atrophy of digits or teeth and other hard and soft parts.

On the other hand, certain types have never made any progress and show little advance over their Paleozoic ancestors; such are the Foraminifera, the sponges, the corals, certain mollusks, as nautilus, king crabs, *Lingula*, and even *Ceratodus* and *Hatteria*. Certain arthropods, as *Peripatus*, *Scolopendrella*, and *Campodea*, are probably persistent types.

Geological extinction has been due to obvious causes, such as changes in climate, the elevation of one area and the subsidence of another, as also to the competition with other types. If these causes are quite obvious in their results, it follows that the same causes which led to the extinction of some forms exerted an influence in modifying others. It should be observed that the imperfection of the geological record is still marked, but many gaps have in late years been closed. See EXTINCTION OF SPECIES.

Evidence from Geographical Distribution. The present distribution (q.v.) of plants and animals can only be explained by reference to past geological changes in the shape and proportions of former continental masses and the resulting geological extinction. We can in many cases only account for the apparently sudden appearance of groups of highly specialized animals in a given area by invoking past migrations. Thus, the camel family (see CAMELIDÆ) originated in western North America, where it has since died out, but is still surviving in South America and Asia. So with the ox family in Eurasia, and the elephants in northeastern Africa, the mammoth (q.v.) having migrated into North America by way of northeastern Asia. This interchange of forms between Eurasia and America, between Asia and Africa, between North and South America, and the changes of climate and other surroundings along the line of march, must have operated in inducing change of habits and variation, and, more especially by isolation, have led to the origin not only of new species and climatic varieties, but to the beginning of new generic and family types. Australia is, in many respects, notably in its characteristic mammals, a Jurassic continent, while Madagascar is a Tertiary island. The moa birds, peculiar to New Zealand, are the result of long ages of isolation and lack of competition with predatory animals.

The various modes of dispersal of organisms and their colonization in remote regions also throw light on the origin of species. The study of deep-sea life is instructive in this connection. It is now generally supposed that the abyssal or benthal fauna originated from shallow-water forms, and that the characters in which these animals differ from those living near the coast are adaptations to life at great depths. Indeed, all the facts and conclusions of zoögeography converge towards the view that, as the different types evidently originated from this or that centre of distribution, so they had common ancestral forms.

Biological Environment. We owe to Darwin and to Wallace the facts and theories epitomized by the terms "natural selection" (q.v.), "struggle for existence," and to Herbert Spencer the expression "survival of the fittest." The competition continually going on between the stronger and the weaker, between original stupidity and acquired wit and cunning, between the plant eaters and the flesh eaters, between parasites and their unwilling hosts, forms a most important chapter in the story of evolution. As soon as, through the action of the primary factors of organic evolution, the ocean began to be peopled with the lowest, most primitive organisms, and when the process of specialization began to operate, then competition between this and that form sprang up, and the struggle for existence—for food, for place, for fixed abodes, or habitats, for a chance to live and multiply and dominate this or that area, and the rivalry of the sexes—set in. The result is *natural selection*, the elimination of the unadapted, of the "unfit," the weak and inept, and the success in life of this or that form which became the founder of some one of the immensely numerous groups of organisms now peopling the globe.

Natural Selection. After the earth became stocked with even a few comparatively simple forms, the selective principles in nature began to operate, resulting in the preservation of the fittest. The factor of natural selection, as stated by Wallace, is based first on "the enormous powers of increase in geometrical progression possessed by all organisms, and the inevitable struggle for existence among them"; and, in the second place, "the occurrence of much individual variation, combined with the hereditary transmission of such variations."

Animals tend to increase in enormous numbers, though, owing to the destruction of eggs and young by animals of their own or other species, the earth's population is scarcely greater now than ages ago. When we consider that the cod lays a million of eggs, and that many other animals are nearly as prolific, the species yet being represented by a constant number of individuals, we see that the rate of embryo and infant mortality is astonishingly great. What is called "viability," or the "prospect of life," in man is in the lower animals reduced to almost infinitesimal proportions. A death rate among us of more than 20 in a thousand excites alarm, but think of the death rate in the cod, the bee, and most animals, where it reaches perhaps the figure of 999,998 out of 1,000,000. All this life is not, however, wasted. The young serve as food for other forms of life, and in this way the balance of nature is maintained, the too great increase in organic life is checked, and those that survive and reach maturity are, so to speak, adequately fed and housed. See LONGEVITY.

In formulating his theory of natural selection Darwin assumed a tendency to variation, the causes of which he did not discuss at length. This variation, by insensible gradations, is, he believed, fortuitous or "chance," this word serving, he adds, "to acknowledge plainly our ignorance of the cause of each particular variation." The useful variations are those which survive. Natural selection, as Darwin claimed, "leads to divergence of character and to much extinction of the less-improved and intermediate forms of life," and he states: "It leads to the improvement of each creature in relation to its organic and inorganic conditions of life, and consequently, in most cases, to what must be regarded as an advance in organization." See NATURAL SELECTION.

Protective Mimicry. Much is said by Darwin, Wallace, Fritz Müller, Bates, and others on this subject, and natural selection appears to play an important part in bringing about protective resemblance. The initial causes of mimicry are the action of light, changes in temperature, etc., which have brought about a variety of patterns of color in insects and other animals of different groups. But it is difficult to account for the resemblance in form as well as coloration between the mimicker and the mimicked unless we invoke the action of natural selection. The disguises of animals, danger signals, the bright spots, lines, bars, and other markings, primarily due, perhaps, to the action of light and shade, have been preserved and exaggerated by natural selection, the process resulting in the preservation of the species thus favored. For further facts and considerations relating to this phase of the subject, see NATURAL SELECTION; MIMICRY; PROTECTIVE COLORATION.

Heredity. The work accomplished by the factors of evolution, including natural selection, would be all lost were the progressively developed characters not transmitted and fixed by heredity. Every one is familiar with the effects of the action of heredity. Its cause has been a mystery, now, however, in part cleared up. See HEREDITY; USE INHERITANCE.

Parasitism. A very considerable portion of the animal world lives at the expense of its hosts. Whole orders of protozoans, worms, crustaceans, several families of hymenopterous and dipterous insects, numerically rich in species, and members of many other classes, derive their existence by simply living within the bodies of their hosts, or attaching themselves to some external part of their bodies. They infest the blood, the muscles, glands, and, in fact, may invade every organ and tissue in the body. A signal example of the good done by parasitic insects in preventing the overcrowding of the earth with injurious insects is the ichneumon fly (q.v.), a parasite of caterpillars, etc. The competition which is going on in the world of life is perhaps no better illustrated than by the work done by those deadly enemies of animal life of all grades, the disease germs of bacteria; yet the bacteria are met and devoured by wandering cells, whose mission it is to prey on such germs.

In short, by a study of these parasitic degenerate forms, in many of which there is a loss of limbs and other organs, we readily understand what a potent cause of profound modification by disuse the habit of parasitism may prove to be. In human history the occurrence of individual and racial weakness, backwardness, and decay due to the various forms of parasitic existence, including slavery, is a conspicuous source of physical and moral degeneration, and is exactly paralleled and illustrated among certain social insects. See ANT; INSECT, *Social Insects*.

The Origin of Man. The proofs of man's origin from some other primate is now past dispute. In fact, no scientist now doubts man's descent, less directly from all lower forms of life, and more immediately from a common ancestor with the anthropoid apes. Anatomically he presents no absolute differences from the anthropoid apes, except in the organs of speech. The relative differences between man and apes are very great, though chiefly confined to the capacity of the skull, the size, number, and complexity of the convolutions of the brain, and the specialization of the forearm in directions ministering to the behests of his brain. He passes through the same embryological phases as the higher mammals. Man's origin from some mammal is strongly attested by the presence in his body of a large number of vestigial characters, which indicate an ancestor that went on all fours—some features appearing shortly before and after birth, hinting at an ape ancestry. The scanty remains of the fossil races, that of Neanderthal or Spy, exhibit some primitive characters, but the discovery of the skull cap, femur, and molar teeth of the Javan so-called "missing link" (*Pithecanthropus erectus*) affords satisfactory evidence of the descent of man from some gibbon-like ape. (See GIBBON.) Experts in craniology state that the cranial capacity of this intermediate form is about 1000 cubic centimeters, while that of a few Australian skulls is even less than that (850 cubic centimeters). (See PITHECANTHROPUS.) This creature stood erect and was of the average height of man, and the general consensus of opinion is that it is geologically Pleistocene.

Still more significant than any of these is what is now known as the Piltdown skull. Several years ago in Sussex, England, the first fragment was discovered in a bed of gravel, and since that time a skull mosaic has been constructed, which is of the greatest interest. The

Neanderthal and other early discovered skulls probably represented a race of cave men, very gorilla-like in general, with great brow ridges and low foreheads. Pithecanthropus was more erect and manlike. The Piltdown man had a forehead as high as a modern man, but a smaller brain, while the rear of the skull and the lower jaw were little different from those of an anthropoid ape.

At the outset man was a social being; his erect posture, large brain, hands, so well adapted to carrying out the suggestions of his developing intellect, so that he was the first tool maker and worker in stone, bone, and wood, and the first being to tame other animals and to cultivate the soil—these qualities enable him to dominate all other animals. At first living a roving, solitary life as a hunter, tribal communities gradually arose here and there, living in fixed habitations and leading a sedentary life, and the developing man eventually became a herdsman, and after long ages a farmer. Even temporary cessations from intertribal wars were provocative of intellectual growth and permitted the origin and growth of the germs of the arts and sciences. Meanwhile he began to migrate, and became, during the Paleolithic age, scattered over wide areas of the earth's surface. Then ensued a process of isolation by geographical and climatic barriers and the differentiation into races—the black being confined to Africa, the yellow to Asia, the red Indian to the Americas, while the cradle of the white race was in the region now including central and southern Europe, and Africa north of the Sahara and the Sudan.

The more civilized man grew, the more prolific he became. The lowest races early, as a rule, ceased to grow. The yellow races in subtropical regions advanced much further in the arts and sciences, but finally remained in a comparatively backward, semifossil condition.

Social Evolution. Up to a certain stage of development—that of the lowest savagery—the evolution of man was due to the action of the same transforming factors as affected lower organic life. The struggle for life, for food, for place, for preëminence, was, however, stronger in the human species than among the animals. Primitive man, his animal passions enhanced by his powerful emotions, stimulated by his growing imagination, his dawning intellectual forces, and his growing self-consciousness, rendered this new creature more cruel, bloodthirsty, and revengeful than the beasts. At first war did not tend to nation building, but was a sporadic outbreak of intertribal inherited hate and revenge, with little result other than brutal sport and exercise. Marriage was little more than animal mating, ownership in property communal, and the primitive spoken language had not arisen out of signs and gestures, through picture writing, into rude alphabets and a written language.

As soon as some scattered tribes had adopted a stationary mode of life, began to cultivate the soil, had domestic animals, and through various necessities made useful inventions, man began to live in a world of new ideas. With fixed abodes, family and tribal customs became handed down, finally becoming laws, and as the result of tribal combats patriotism and the social virtues took root. With ancestor worship, reverence for the dead, ideas of a future life, poetry, art, architecture, sprang up. Commerce was, even in the earliest ages, as now, a great civilizer, as was ownership in flocks and herds and in land. Man began to have his individual rights, and the germs of morality, or the right relations between man and man, gradually evolved.

As the population of a given tribe or aggregate of tribes increased, there ensued a differentiation of the trades and arts, a separation into political and religious classes, and finally a degree of civilization, of which the Egyptian type was the earliest, in which an alphabet gradually replaced hieroglyphics, and a complicated religious ceremonial and theology superseded savage rites. The new man, with his moral nature enhanced, his imagination aroused, his memories of the past handed down by poets and scalds, his thoughts turning upward and away from animal existence, became gradually, in the noblest specimens of his race, actuated by entirely new sets of ideas, and the factors of his moral development began to act with increasing force.

Religious Evolution. Besides the purely moral factors, all through the course of man's development the religious feelings were constantly active and growing. The lowest savage practices religious rites, worships material emblems of a higher or supreme power, or fetishes which stand for a rude idea of worship (protection from the ills of life), while the most primitive man has some slight conception of a future life. Yielding to his murderous instincts, the earliest fratricide or thief, reflecting on his crime, would experience self-accusing feelings of remorse, and there would follow the expiation for the crime, or the feeling that one may be saved from the results of wrongdoing by propitiating the higher powers. The functions of the earliest physician, theologian, and philosopher were combined in the first "medicine man" and primitive theology also held the germs of primitive science. At first gross and materialistic conceptions of religion prevailed. Nature worship was succeeded by polytheism, and this by monotheism. Theology has gradually been purified; genuine religion, besides the worship of goodness or God, has developed love for man, and the factors in religious evolution have been faith, hope, and charity, and an increased observance of the "golden rule."

Summary and Conclusion. Life appears to have been a necessary and inevitable result of inorganic or cosmic evolution. It came into being on our planet in the most natural way as soon as the temperature of the originally superheated planetary mass became sufficiently lowered, and the gaseous matter had been condensed into a universal sea. It arose by the action of physicochemical laws, through what we call spontaneous generation, the materials for the formation of the first bit of living protoplasm being ready at hand. When once formed, motion, change, and the action of the primary factors, exerted through a great length of time, resulted in the differentiation or divergence of characters, and specialization went on, conditioned by and dependent on the increasing changes in the internal structure and physical geography of the globe.

Variation was most probably neither fortuitous nor by chance, but was due to changes in the environment, and therefore was necessarily in direct relation with such changes, resulting in the wonderful adaptation, variety, beauty, and harmony reigning through the organic world.

Putting together all the facts of geology and biology observed during the past century, a few of the more observant and thoughtful naturalists have, by the inductive method, to some extent worked out the mechanism of evolution. The theory is a good working one, indispensable in research. Still, we know only in part the guiding, controlling cause. There seems to be something more than the action of the physical factors and natural selection, which we cannot fathom. There has evidently been all through the process a modifying power, the nature of which science has not yet grasped. The striking fact in the whole course of evolution is that progress has been along certain useful and beneficent lines; that the ill-fitted, inadapted, degenerate, useless, however useful at first, have had to make way for higher forms better adapted to continually changing and improving conditions. Intelligence, mind, order, harmony, system, and good rather than bad conditions have resulted from and operated since the original chaos when physical force, energy, alone prevailed. There is a constant tendency seen in the evolution of the more favored human races towards improvement, intellectual, moral, and spiritual. Epoch-making men, the highest representatives of our race, have shaped the age in which they lived and in various directions given this and that impetus to the upward progress. There has been a directive force through it all, which has controlled and led life forms along definite paths.

Natural selection alone, or the action of the primary factors, cannot entirely account for it. The universe, our world, life, and nature, were not self-evolved. It seems to be a reasonable induction that a self-conscious power and will outside of, and yet immanent in, matter gave the first impress to the nascent universe, what we call natural laws being the mode of working, and in some unknown way providing the germs of self progress along improving lines.

The evolution theory and its implications, therefore, immeasurably enhance our conception of Deity and suggest most strongly that there is a divinity which has shaped our ends. The outcome of the whole is optimism, hope, giving the certitude that man's future will brighten, and that, as the ages roll on, life will be far more worth living than even now.

History of the Evolution Theory. Aristotle (384–322 B.C.) may be regarded as the father of the theory of descent, although Empedocles has been credited with the conception. The latter taught in a vague way the fact of the gradual succession of life forms from the less to the more perfect, though he did not claim any genetic relation, but believed that they were separately created. The wonderfully comprehensive mind of Aristotle, who was the first anatomist, conceived of a genetic series, of a chain of being from polyps to man; he perceived the wonderful adaptation in nature, the principle of the physiological division of labor, and regarded life as the function of the organism, not as a separate principle. He recognized the fact of heredity, atavism, and believed in the inheritance of mutilations.

The nearest approach which the didactic poet Lucretius made to the evolution idea is to be found in his account of the development of the faculties and arts among the human races.

St. Augustine (354–430 A.D.) spoke of the creation of things by series of causes, and Thomas Aquinas (1226–74) expounded and upheld St. Augustine's view. But the idea of special creation became the universal teaching from the middle of the sixteenth to the middle of the nineteenth century.

That broad-minded early German philosopher Leibnitz (1646–1716) gave examples of the gradation of characters between living and extinct forms as proofs of the universal gradation or connection between species. He believed in a chain of being and that the different classes of animals are so closely united that there are no gaps between them. He also suggested that by means of great changes of habitat "even the species of animals are often changed"; he also taught the doctrine of the continuity of nature and was the author of the saying, *Natura non facit saltum.*

Buffon (1707–88) thoroughly read and was influenced by Leibnitz's writings. Whether or not he owed his evolutional views to Leibnitz, he stated, and as frequently denied, the mutability of species. He suggested that such changes were directly produced by changes in climate, food, and domestication, and he gave a few examples of the effects of disuse and held that all animals were possibly derived from a single type.

A stronger, more observant, and bolder reasoner than Buffon was Erasmus Darwin (q.v.), the grandfather of Charles Darwin. He was a country doctor, not a working naturalist, but a remarkably close observer and a sound thinker. He claimed that all animals were derived from "a single filament," insisted on the effects of changes of climate, of use, characters being produced by the exertion of animals. He was the first to propose the factor of sexual selection, stated the principle of the law of battle, quite fully elaborated the idea of protective mimicry, and vaguely stated the doctrine of use inheritance.

The true founder of evolution, however, was Lamarck (q.v.), who was the leading zoölogist of the period between Linnæus and Cuvier (1744–1829). In 1801 he first published his evolutionist views. He taught in his lectures (1801–06) and in his *Philosophie zoölogique* (Paris, 1809) that all organisms arose from germs; that development was from the simple to the complex; that the animal series was not continuous, but treelike; and he constructed the first phylogenetic tree. The Lamarckian factors are the changes of environment, climate, soil, food, and temperature, such changes being direct in plants and the lowest animals, indirect in the higher animals. He speaks of the struggle for existence, stating that the stronger devour the weaker, and refers to competition. He discussed at length the effects of use and disuse, taught that vestigial structures are the remains of organs actively used by the ancestors of existing forms, and claimed that new wants or necessities induced by changes of climate, habitat, etc., result in the production of new propensities, new habits, and new functions. Change of habits, he says, originate organs, change of functions create new organs, and the formation of new habits precedes the origin of new organs or modification of organs already formed. He refers to the swamping effects of crossing, and to isolation as a factor. His definition of species is the most satisfactory yet stated. Lamarck's views were not generally accepted, but misrepresented or ignored, largely through the influence of Cuvier and his disciples. See LAMARCKISM; NEO-LAMARCKISM.

Notwithstanding this history, it was reserved for Charles Darwin, in 1859, seconded by A. R. Wallace, to convert the scientific world to evolutional views. The new theory he specially advocated was that of natural selection. Darwin claimed that there was a universal tendency of fortuitous variation; its causes, he thought, were only in part known. He showed that favorable variations were preserved and that natural selection has a directive force. He dwelt convincingly on the facts of competition, of the struggle for existence, and on the biological environment. At the same time his *Origin of Species* was a massive and irresistible argument for the doctrine of descent; and as further expounded and upheld by Hooker, Huxley, Fritz Müller, Haeckel, and others, it became generally accepted. Darwin was the prince of observers and experimenters. He was also an expert systematist, a clear, persuasive writer; and into whatever field he entered his work was epoch-making.

Meanwhile in England, as early as 1852, Herbert Spencer advocated evolution from a philosophical point of view. He proposed the term "evolution" both for the inorganic and organic world. His broad, synthetic mind grasped the full significance of cosmic evolution, and he extended the doctrine of descent to human history, human society, morals, ethics, and religion. He is the philosopher of science and of all that pertains to man. He has worked rather along Lamarckian lines, holding that natural selection as such was of secondary importance, as compared with the primary factors of organic evolution.

After Darwin's death, under the leadership of Alfred Russel Wallace, and especially of Weismann, the school of Neo-Darwinism (q.v.) arose. Weismann, distinguished by his great work on the embryology and metamorphism of insects, and his investigations on temperature forms, has shown that heredity has a physical basis, the chromatin being the bearer of heredity. He asserts the "all-sufficiency" of natural selection and claims that variability is due to sexual reproduction.

The mutation theory of De Vries does not attempt to supplant natural selection, Weismannism and Mendelianism, but complements these. Like the latter theory, it emphasizes the importance of the congenital hereditary characters contained in the germ plasm. It differs from the Darwinian theory in holding that the new forms occasionally arise by great leaps, in place of the slow accumulation of slight fluctuating variations. The old Lamarckian doctrine of the inheritance of acquired characters, at least in its direct application, is rapidly losing ground.

In some directions we find the theory of orthogenesis becoming stronger. This was originally sponsored by Nägdé and Eimer, and holds that evolution is less the result of chance than by direct linear progressive modification.

Even with all these theories, we find much of the mystery of evolution still unsolved. In one of the most recent reviews of the subject, Bateson's *Problems of Genetics*, we find almost more destructive than constructive theories and arguments. But the intensive study now being brought to bear on every aspect of the problem cannot fail to yield results of great importance in the near future.

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EVOLUTION (IN MATHEMATICS). See INVOLUTION AND EVOLUTION.

EVOLUTIONS, MILITARY. The movements by which bodies of troops are enabled to change position, order, or formation. The term embraces such movements as changes of front, formations of line, column, échelon, or square. While the primary principles of scientific warfare remain practically the same, the modern developments of artillery and musketry fire have greatly affected the dispositions of battlefields and consequently changed the essential principles involved in preparations for war. The ability of infantry, e.g., to wheel accurately, coolly, and with precision, or deploy in front of the enemy, with the steady deliberation of the parade ground, formerly so much admired, is to-day replaced completely by widely extended intervals and distances in all fighting formations. Changes of front are now made speedily, the men moving by the shortest possible direction to their new front. In brief, the spirit of the old order of military evolution was to stamp out all individuality in the rank and file, making of the soldier an automaton of little or no value as a separate entity. Modern evolutions, on the other hand, magnify the individual, encourage individuality, and from time to time decrease the tactical unit of command. See TACTICS, MILITARY.

ÉVORA, ȧ'vô-rȧ. A city of Portugal, capital of the Province of Alemtejo, situated in a fertile and elevated plain, 75 miles east by south of Lisbon (Map: Portugal, B 3). It is irregularly built, with narrow streets, and is protected by old walls and towers and some recently constructed fortifications. It contains remains of great historic interest. The Gothic cathedral dates from the twelfth century and has considerable architectural beauty. Of Roman antiquities there are a ruined temple (unwarrantably called the temple of Diana), with fine Corinthian columns, and an old aqueduct (rebuilt) which supplies the city with water. Evora has been the seat of an archbishop since the sixteenth century and has an archiepiscopal library with about 25,000 volumes and 2000 manuscripts and a number of paintings. The archæological museum is one of the most interesting in Portugal. The town has cotton and woolen manufactures and iron furnaces. It carries on a considerable trade in wine. Pop., 1890, 15,134; 1900, 16,152; 1911, 17,901. Evora, the ancient Ebora, was captured by the Romans in 80 B.C. and became a colony with the name *Liberalitas Juliæ*. It was taken by the Arabs in 712, but was recovered by the Christians in 1166.

ÉVREUX, ȧ'vrẽ'. The capital of the Department of Eure. An episcopal city of Normandy, France, on the Iton, an arm of the Eure, 67 miles west-northwest of Paris (Map: France, N., G 3). It is an old-fashioned town, with wide streets and numerous promenades. Its principal building, the cathedral of Notre Dame, which dates from the eleventh century, is a composite of various styles of architecture. The north portal, built in sixteenth-century flamboyant style, is especially fine. Other buildings include the abbey church of St. Taurin, originally built over the tomb of St. Taurin, the first Bishop of Evreux, a thirteenth-century shrine; the bishop's palace, built in 1481; and the Tour de l'Horloge (clock tower) of the same century. Evreux has a botanical garden, a lycée, a library of 21,000 volumes, and a small museum situated in the town hall, which contains relics found at Vieil Evreux. Its educational institutions are two theological seminaries, a teachers' college, and a school of design. Evreux manufactures linen, shoes, gas engines, metal ware, pianos, leather, meal, mustard, and has an extensive business in grain. Pop. (commune), 1901, 18,292; 1911, 18,957. It was taken by Clovis from the Romans, was sacked and plundered in 892 by the Northmen under Rollo, was burned by Henry I of England in 1119, and in 1194 and again in 1199 was captured by Philip Augustus, King of France. It was frequently taken and retaken in the wars of the fifteenth century between France and England.

Vieil Evreux (*Old Evreux*), a village near Evreux, is the site of ancient Mediolanum and has remains of a theatre, an aqueduct, baths, and fortifications. Pop., 1901, 275; 1911, 253.

EWALD, ä'väl, Carl (1856–1908). A Danish novelist and poet, born in Schleswig. After the War of 1864 the family moved to Copenhagen, where Carl was educated at the University. For a time he served as a forester, but after 1887 he devoted himself to his literary work. At first he published school books and made translations. In his novel *Den gamle Rum* (Eng. trans., *The Old Room*, 1908) he portrays the character change of a man who deserted a conventional life for one of freedom; and in its sequel, *Cordt's Son* (Eng. trans., *Cordt's Son*, 1908), he shows the life of a man who strictly observed all the social conventions. He is also author of *Singleton's Udenlandsrejse* (1894); *Glaede over Denmark* (1898); *Sulasmiths Have* (1898); *Der Kinderkruezzug* (1896; Ger. trans., 1899); *Mein Kleiner Junge* (1899; Eng. trans., 1906); *Crumlin* (1900). Alexander T. de Mattos translated others of his works under the following English titles: *My Little Boy* (1906); *Two-Legs* (1906); *The Spider and Other Tales* (1907); *The Pond and Other Stories* (1909); *The Four Seasons* (1913).

EWALD, ä'vält, Georg Heinrich August von (1803–75). A German Orientalist and theologian. He was born and educated at Göttingen and in 1823 was appointed instructor in the gymnasium of Wolfenbüttel. In the following year he was made lecturer in the theological faculty of Göttingen, and three years later he became professor extraordinarius of Oriental languages. His full professorship was granted him in 1831. Having become involved, together with the brothers Grimm, Dahlmann, Gervinus, Albrecht, and Weber in the protest against the abrogation of the constitution which the King of Hanover had been obliged to grant in 1830, Ewald was removed from his professorship in 1837. He went in the following year to Tübingen as professor in the philosophical faculty, from which he changed in 1841 to the theological. Here, however, he became involved in controversies with the Catholics, Hegelians, and Pietists. He left Tübingen after having been ennobled by the King of Württemberg and was reinstated in his old position at Göttingen in 1848. For many years, in addition to his professorial duties, Ewald was engaged in active support of the movement for Protestant reform in Germany. After Hanover was annexed to Prussia, in October, 1866, his loyalty to the dethroned dynasty caused him to refuse to take the oath of allegiance to the King of Prussia. As a result of this decision, expressed with great vigor and bitterness, he was removed from his position, and pensioned in 1868. Ewald represented repeatedly the city of Hanover as a member of the Guelph faction in the North German and German diets.

Ewald wielded an immense influence as a scholar, and his learning was profound. He did much for Hebrew scholarship and for the critical study of Hebrew history. His *History of Israel* was the most influential work on the subject in his generation. His writings, excepting his expressions on political subjects, which were merely temporary in their interest, were almost entirely on the Old and New Testaments and on Arabic. Among those on Hebrew philology and theology are his *Ausführliches Lehrbuch der hebräischen Sprache* (8th ed., 1870); *Hebräische Sprachlehre für Anfänger* (4th ed., 1874); *Geschichte des Volkes Israel* (7 vols., 3d ed., 1864–70); *Die Altertümer des Volkes Israel* (3d ed., 1866); and *Die Lehre der Bibel von Gott oder Theologie des alten und neuen Bundes* (4 vols., 1871–78). The principal works on other Semitic languages are: *Grammatica Critica Linguæ Arabicæ* (2 vols., 1831–33); *Abhandlung uber des äthiopischen Buches Henókh Entstehung* (1854); *Ueber die phönikischen Ansichten von der Weltschöpfung und den geschichtlichen Wert Sanchuniathons* (1857). Of a more miscellaneous character are his *Sprachwissenschaftliche Abhandlungen* (3 parts, 1861–71); *Verzeichniss der orientalischen Handschriften der Universitätsbibliothek zu Tübingen* (1839); *Ueber einige ältere Sanskritmetra* (1827). Ewald was also the founder (1837) and one of the editors of the *Zeitschrift für die Kunde des Morgenlandes* as well as of the *Jahrbücher der biblischen Wissenschaft* (1849–65). The following have been translated into English: *Hebrew Grammar* (1870); *History of Israel* (1867–74); *Antiquities of Israel* (1876); *Commentary on the Prophets* (1876–77); *Isaiah* (1869); *Life of Jesus Christ* (1865). Consult Cheyne, *Founders of Old Testament Criticism* (London, 1893).

EWART, ū'ärt, David (1843–). A Canadian architect. He was born near Edinburgh, Scotland, and was educated there at the public schools and at the Edinburgh School of Arts. He came to Canada and in 1871 was appointed assistant to the assistant engineer and architect of the Department of Public Works, Ottawa. In 1897 he was appointed chief architect of the department. Among his works are the completion of the main tower of the Dominion Parliament buildings, Ottawa, and the Canadian buildings at the Paris Exposition and at the Chicago World's Fair. In 1903 he received the decoration of the Imperial Service Order. In 1906 he was appointed a member of the board of assessors, with respect to the new departmental buildings at Ottawa. In 1909 he became a councilor of the Royal Architectural Institute of Canada.

EWART, ū'ärt, James Cossar (1851–). A Scottish naturalist, born in Penicuik, Midlothian. He was educated at Edinburgh University and in 1874 was demonstrator of anatomy there. In 1875–78 he was conservator of the London University College Museum, in 1878–82 was professor of natural history at Aberdeen, and in 1882 became Regius professor at Edinburgh. He started a marine station near Aberdeen in 1879, in 1882–92 was prominent in scientific work in connection with fisheries, and devoted his later years to the study of horses and especially to experiments at Penicuik in hybridization of horses, zebras, and donkeys, which were of particular importance as disproving telegony. His publications include: *Locomotor System of Echinoderms* (1881), with G. J. Romanes; *Fish Culture in America* (1884); *On the Preservation of Fish* (1887); *The Electric Organ of the Skate* (1888–89); *The Development of the Limbs of the Horse* (1894); *The Penicuik Experiments* (1899); *Multiple Origin of Horses and Ponies* (1904); *On a Prejvalsky Hybrid* (1907).

EWART, John Skirving (1849–). A Canadian lawyer and publicist. He was born in Toronto, was educated at Upper Canada College, studied law, and was called to the bar in

1871. Until 1882 he practiced his profession in Toronto, then until 1904 in Winnipeg, and after that in Ottawa, where he took rank as one of the leaders of the bar. In the prolonged educational and religious contest over the Manitoba school question (see Manitoba, *History*) Ewart represented the Roman Catholic minority, defending separate schools, not only in the courts, but in leading periodicals. He wrote several legal works of a technical character, and in 1883–90 edited and published reports of cases before the Manitoba courts. After 1900 he paid special attention to the political questions which arose in consequence of the increased importance of Canada as a member of the British Empire. He strongly opposed imperialistic views. In 1910 he was chief counsel for Canada before The Hague tribunal. In addition to the legal works before mentioned, he published: *The Kingdom of Canada and Other Essays* (1908); *Sir John Macdonald and the Canadian Flag* (1908); *Canadian Independence* (1911); *The Kingdom Papers* (1912).

EWART, William (1848–). An English physician, born in London. He was educated at Paris, at Berlin, and at Cambridge, where he was scholar of Gonville and Caius College. He was examiner and Goulstonian lecturer to the Royal College of Physicians and assistant physician to the Brompton Hospital for Consumption, besides being consulting physician to many hospitals. He specialized in diseases of the heart and the lungs, and wrote: *Pulmonary Cavities* (1882); *Cardiac Outlines* (1892); *Heart Studies, Chiefly Clinical* (1894); and the articles "Bronchitis" and "Bronchiectasis" for Allbutt and Rolleston's *System of Medicine*, and a part of the Royal Medical and Chirurgical Society's *Report on Climates and Baths of Great Britain*, vol. ii (1902).

EWBANK, ū'bănk, Thomas (1792–1870). An American scientist and writer. He was born in Durham, England, but emigrated to America about 1819 and from 1820 to 1836 was engaged in the manufacture of metallic tubing. From 1849 until 1852 he was United States Commissioner of Patents. Among his publications are: *A Descriptive and Historical Account of Hydraulic and Other Machines, Ancient and Modern* (1842; 15th ed., 1863); *The World a Workshop, or the Physical Relation of Man to the Earth* (1855); *Life in Brazil* (1856); *Thoughts on Matter and Force* (1858); *Reminiscences in the Patent Office* (1859); *Inorganic Forces Destined to Supersede Human Slavery* (1860).

EWE. A speech group of pagan negro peoples on the slave coast of Africa in Dahomey and Togoland. Keane gives the following list of peoples speaking dialects of Ewe: *Awuna*, *Avenor*, and *Ataklu*, 45 miles inland on the Volta; *Agbosimi*, and *Aflao*, coast from Volta to Togoland; *Krikor*, north of Aflao; *Togo*, coast of Togoland; *Geng*, Porto Seguro and Little Popo, Great Popo, between Little Popo and Whydah; *Dahoman*, inland between Great Popo and Kotonu; *Ewemi*, north of Kotonu; *Fra* and *Appi*, from Kotonu to Yoruba frontier; *Anfueh*, *Krepe*, and *Ewe-Awo*, Togoland; *Mahi* (Makki), *Affakpami*, *Aja*, north and west of Dahoman. It is probable that the Ewe came from the northeast (possibly Borgu or Gurma) only a few centuries ago. Their culture is typically West African. They depend for food mainly on agriculture, the chase being monopolized by a special caste. Juridical procedure is highly developed, and there is an unusual complexity of religious conceptions. Consult: Keane, in Stanford's *Africa*, vol. i (London, 1895); Ellis, *The Ewe-Speaking Peoples of the Slave Coast of West Africa* (ib., 1890); Spieth, *Die Ewe-Stämme* (Berlin, 1906).

EWELL, ū'el, Arthur Woolsey (1873–). An American physicist. Born at Bradford, Mass., he graduated from Yale University in 1897 (Ph.D., 1899) and also studied at Johns Hopkins and the University of Berlin. He was instructor in physics and assistant professor at Worcester (Mass.) Polytechnic Institute between 1897 and 1910, when he became professor. He became a fellow in the American Academy of Arts and Sciences. He is author of *A Text-Book of Physical Chemistry* (1909); *Physical Measurements* (1910; 2d ed., 1913); *Artificial Rotatory Polarization* (1911).

EWELL, Benjamin Stoddert (1810–94). An American educator, brother of Richard Stoddert Ewell. He was born in Washington, D. C., and was educated at West Point, where, after graduating in 1832, he was an instructor in mathematics until 1836. After three years as assistant engineer of the Baltimore and Susquehanna Railroad he became professor of mathematics at Hampden-Sidney College, Virginia, remaining there until 1846, and from 1846 to 1848 he held a similar position at Washington University, Lexington, Va. In the latter year began his long connection with William and Mary College, which ended only with his death. First elected to the chair of mathematics, he became president in 1854, a position which he held until 1888, save for the interval of the Civil War, in which he served in the Confederate army as colonel of a Virginia regiment and as adjutant general on the staff of Gen. Joseph E. Johnston. From 1888 until his death he was president emeritus.

EWELL, Marshall Davis (1844–). An American lawyer, born at Oxford, Mich. He graduated from the Michigan State Normal School in 1864 and from the University of Michigan Law School in 1868. In 1877 he became professor at the Union College of Law in Chicago, and later he founded the Kent College of Law, of which he became professor, president, and dean. In 1890–96 he lectured on medical jurisprudence at the University of Michigan. He also became known as a handwriting expert and microscopist and was president of the American Microscopical Society (1893, 1906) and of the Illinois Microscopical Society (1909, 1911). He edited *Blackwell on Tax Titles*, *Evans on Agency*, and *Lindley on Partnership*, published some 200 papers in scientific and law journals, and is author of *Leading Cases on Disabilities* (1876); *Treatise on the Law of Fixtures* (1876; 2d ed., 1905); *Essentials of the Law* (1882); *Manual of Medical Jurisprudence* (1887; 2d ed., 1909); *Essentials of Commercial Law*, with Whigam and Skinner (1913).

EWELL, Richard Stoddert (1817–72). An American Confederate soldier, brother of Benjamin Stoddert Ewell. He was born at Georgetown, D. C., graduated at West Point, and was assigned as lieutenant of dragoons in 1840, and served in the Mexican War, participating in the engagements at Contreras and Churubusco. He attained the rank of captain, took part in the suppression of the Apache outbreak in 1857, and, on the outbreak of the Civil War, in 1861, resigned his commission and entered the service of the Confederacy, being actively engaged throughout the war. As a major general, he commanded a division at the first and second battles of Bull Run, at Antietam, and under Jackson at Warrenton Turnpike, where he was severely wounded. After the death of Jackson at Chancellorsville he succeeded to his command with the rank of lieutenant general, took part in the battles of Gettysburg and the Wilderness, and was finally captured with his entire corps by Sheridan, at Sailor's Creek, April 6, 1865. After the war he lived in retirement.

EWER, ū'ẽr, Ferdinand Cartwright (1826–83). An American clergyman of the Protestant Episcopal church. Born at Nantucket, Mass., he graduated at Harvard in 1848, in 1849 became a journalist in California, and in 1858 was ordained a priest of the Protestant Episcopal church. In 1858–60 he was rector of Grace Church, San Francisco, Cal.; in 1860 he was appointed assistant minister of St. Ann's Church, New York City, and in 1862 rector of Christ Church. Because of his extremely ritualistic innovations he occasioned a disturbance in the parish and found it best to resign. In 1871 he became rector of St. Ignatius' Church, which was organized for him by his friends and sympathizers, and in which he developed very elaborately his ideas regarding the conduct of the service. His publications include: *Two Eventful Nights or the Fallibility of Spiritualism Exposed* (1856); *Sermons on the Failure of Protestantism* (1869); *Catholicity in its Relations to Protestantism and Romanism* (1878); *Grammar of Theology* (1880).

EWING, ū'ĭng, Finis (1773–1841). An American clergyman, a founder of the Cumberland Presbyterian Church. He was born in Bedford Co., Va., whence he removed to Tennessee and later to Kentucky. In 1802 he was licensed to preach by the Cumberland presbytery and for several years thereafter labored with much success as a revivalist. He formed, with two other clergymen, in 1810, the presbytery from which the Cumberland Presbyterian Church was developed. He was subsequently pastor at New Lebanon (Cooper Co.), Mo., in 1820–36, and at Lexington (Lafayette Co.) in the same State from 1836 until his death. His *Lectures on Important Subjects in Divinity* appeared in 1824. Consult Cossit, *Life and Times of Finis Ewing* (Nashville, 1853).

EWING, Hugh Boyle (1826–1905). An American lawyer, soldier, and diplomat, son of Thomas Ewing. He was born at Lancaster, Ohio, studied at West Point, in 1849 went to California by way of New Orleans and Texas, and upon his return in 1852 studied law, which he practiced at St. Louis, Mo., in 1854–56, and at Leavenworth, Kans., in 1856–58. In 1861 he entered the United States army as brigadier inspector of Ohio Volunteers. He commanded a brigade at Antietam and Vicksburg, and at Chattanooga the division which constituted the advance guard of Sherman's army, and took Mission Ridge after a desperately contested struggle. He was appointed a brigadier general in 1862 and brevetted major general in 1865. From 1866 to 1870 he was United States Minister to The Hague. His publications include *A Castle in the Air* (1887) and *The Black List* (1893).

EWING, James (1866–). An American pathologist, born at Pittsburgh, Pa. He graduated from Amherst College in 1888 and in 1891 from the College of Physicians and Surgeons (Columbia University), where, after further study in Vienna, he was tutor, fellow, and instructor (1893–99). In 1899 he became professor of pathology at Cornell University Medical School. He was president of the Association for Cancer Research in 1907 and of the Harvey Society in 1908. He is author of *Clinical Pathology of Blood* (1901; 2d ed., 1903); "Identity," "The Signs of Death," and "Sudden Death," in the *Text-Book of Legal Medicine and Toxicology* (1903); "Blood," in the *Text-Book of Legal Medicine* (1910).

EWING, Sir (James) Alfred, K.C.B., F.R.S. (1855–). A Scottish physicist and engineer. He was born at Dundee, March 27, 1855, and was educated at the Dundee high school and the University of Edinburgh. For several years he was assistant to Lord Kelvin and Prof. Fleeming Jenkin. In 1878 he was appointed professor of mechanical engineering in the Imperial University of Tokyo, and while in Japan he devoted himself assiduously to the study of earthquakes, devising seismographs to record the earth's vibrations during such disturbances. In 1883 he resigned to become a professor of engineering in the University College, Dundee, and from 1890 to 1903 he was professor of mechanism and applied mechanics in the University of Cambridge. From 1903 to 1906 he was a member of the Explosives Commission and a member of the Ordnance Research Board, 1906–08. In 1907 he was made C.B., and K.C.B. in 1911. He is the author of a treatise on *Magnetic Induction in Iron and Other Metals* (1891), a work which followed a series of researches in the various phenomena of magnetism published in the *Philosophical Transactions* and the *Proceedings of the Royal Society*. Professor Ewing invented a magnetic curve tracer, a hysteresis tester, and a permeability bridge, which are used by electrical engineers and steel makers in testing the iron employed in the construction of dynamos and transformers. His work on earthquakes resulted in the publication of *Earthquake Measurement* by the University of Tokyo in 1883, and other papers by the Seismological Society of Japan. He also wrote: *The Steam Engine and Other Heat Engines* (1894); *The Strength of Materials* (1899); *The Mechanical Production of Cold* (1908).

EWING, Juliana Horatia (1841–85). An English writer of stories for children. She was born at Ecclesfield, Yorkshire, England, where her father, Alfred Gatty, was vicar. Her mother was Margaret Gatty, who wrote *Aunt Judy's Tales* (1858) and other stories and started *Aunt Judy's Magazine* (1866). After the death of Mrs. Gatty (1873) the magazine was conducted for two years by Juliana and her sister. In the meantime (1867) Juliana had married Major Alexander Ewing, of the army pay department. Mrs. Ewing wrote her first story, *A Bit of Green*, for the *Monthly Packet* (July, 1861), but most of her work was contributed to her mother's magazine. Among her many tales are: *Mrs. Over-the-Way's Remembrances* (London, 1869); *The Brownies* (ib., 1870); *Six to Sixteen* (ib., 1876); *Brothers of Pity* (ib., 1882); *Jackanapes* (ib., 1884). She died at Bath, May 13, 1885. Consult H. K. T. Gatty, *Juliana Ewing and her Books* (London, 1885).

EWING, Thomas (1789–1871). An American statesman, born in Ohio Co., West Va.

He graduated at Ohio University (Athens, Ohio) in 1815. The year following he studied law and was admitted to the bar at Lancaster, where he began his practice. In 1831 he was elected as a Whig to the United States Senate. He was a strong advocate of the recharter of the United States Bank and protested vigorously against the action of Jackson in withdrawing the government deposits from it, and after the "specie circular" of Secretary Woodbury was issued in 1836 proposed a measure for its annulment. After the expiration of his senatorial term in 1837 he resumed the practice of his profession, but served as Secretary of the Treasury from March till September, 1841, when he retired because of the differences between President Tyler and the Whig party. In 1849 Ewing again entered the cabinet, this time as the first Secretary of the newly established Department of the Interior. In June, 1850, he was appointed by the Governor of Ohio a United States senator, to serve the unexpired term of Thomas Corwin, who had resigned to enter Fillmore's newly constituted cabinet as Secretary of the Treasury. He remained in the Senate until 1851. He was a delegate to the Peace Congress at Washington in 1861, but unreservedly supported the Lincoln administration during the Civil War.

EXAM'INA'TION (Lat. *examinatio*, from *examinare*, to examine, from *examen*, tongue of a balance, from *exigere*, to weigh, from *ex*, out + *agere*, to lead). The process of testing a student or a candidate from some scholastic, professional, or other position, with the purpose of discovering either the proficiency that has been attained in certain lines of study and of knowledge possessed or the capacity for doing certain lines of work in the future. Both of these purposes may enter into an examination and usually should, for it is the minimizing of the latter purpose that has caused so much criticism of the scholastic custom. The use of examinations as a test of fitness for civil service is discussed under the title Civil Service. Aside from the Oriental, especially Chinese, civilization, which has had no educational influence on the West, the use of examinations as a scholastic test seems to have begun in the mediæval universities, where the conferring of the baccalaureate degree was conditioned upon the ability to define and explain terms before a company already possessed of the degree, and of the mastership or doctorate upon the ability to "dispute" or to defend a thesis before a group or a faculty, each member of which was possessed of the degree sought. Since then examinations have become a practice of every part of the modern educational system, both as a test of the completion of the component part of the system, and as a test of fitness for admission into more advanced parts of the general system or into specific institutions.

It is the confusion of the two purposes that has given rise to some of the most complicated problems of modern education, chiefly because the test of a completed portion of work can become, even if not necessarily so, largely an exercise in memory, while the test of ability to undertake other and more advanced lines of work may have little relation to the excellence of the memorizing activities or to the possession of mere information. The use of examinations in the former sense may be extended so as to furnish a test of the standing or even of the financial support to be given to institutions. In this latter application it forms a feature of the public-school system of the State of New York, and as "payment by results" was the chief feature of the elementary school system of England until the close of the last century and is still to a large extent characteristic of the Irish educational system. When used as a test of knowledge, especially when some exterior end is sought, examinations may lead to serious injury to educational work: the work of instruction becomes formal, the intellectual discipline is superficial, and the information acquired is soon forgotten. When the passing of examinations becomes a prominent motive, the higher purposes and aims in education are lost sight of. These difficulties in connection with the uses of examinations are met in different ways. In England examination by competent inspectors has been substituted as a test of the quality of the work done in both elementary and secondary schools. There is also a tendency to introduce the oral interview in some examinations, e.g., for entrance into the naval colleges. In the elementary grade of the American public schools the recommendation of the teacher, based upon an intimate knowledge of the work of the child, is a partial if not a complete substitute for the multitude of examinations formerly given. For the very burdensome college entrance examination, both certification by schools and a combination of secondary school finals and college entrance examinations through a general board are being widely substituted. See Colleges, American; Oxford University; Cambridge University; National Education, Systems of. Consult: Hadley, *The Education of the American Citizen* (New York, 1901); Latham, *The Action of Examinations* (Boston, 1886); Herbert, *The Sacrifice of Education to Examination* (London, 1889); Monroe, *Cyclopedia of Education, s. v. Examinations* (New York, 1911).

EXAMINATION. In judicial proceedings, the process by which the testimony of witnesses is elicited and sifted. It is ordinarily conducted by the counsel for the parties, although the trial judge has the right to ask questions of a witness at any time. The first examination on behalf of the party calling the witness is known as the direct examination, that on behalf of the opposite party as the cross-examination, and any further questioning by the first party is called redirect examination. As a rule, the party calling a witness has no right to ask leading questions, i.e., questions which suggest to the witness the answers which are desired by the examiner. It is the duty of the court to see that witnesses receive decent and respectful treatment from counsel. For a further discussion, see Evidence; Witness; Torture; etc.; and consult the authorities there cited; also Ballantine, *Experiences of a Barrister's Life* (New York, 1883).

EXAMINATION, Physical. In legal proceedings, the medical or surgical examination of a living person by judicial order or as a part of legal proceedings to determine the existence or the nature of a physical injury alleged to exist, or of a physiological condition upon which the rights of a party to the proceeding may depend. It is especially available in actions for personal injury due to willful violence or to negligence, and in cases of abortion, malpractice, and rape. Whether a court of justice has the power to compel a party to an action to submit to a physical examination is a question upon which judicial decisions are at variance. It has been answered in the negative by the United States Supreme Court and by courts of last resort in several of the States, while an affirmative answer has been given by many State tribunals. The power has been denied on the ground that the right of every individual to the possession and control of his own person is held sacred and carefully guarded by the common law. That right, it is said, is as much invaded by a compulsory stripping and exposure as by a blow.

Other courts have affirmed the existence of this power, on the ground that the end of litigation is justice, and that whenever the physical examination of a party litigant is necessary to the ascertainment of the truth and the award of justice, such examination may be ordered. The latter view has received statutory sanction in some of our States. (See chap. 721, N. Y. Laws, 1893.) Even where this view prevails, the exercise of the power in a given case is a matter of judicial discretion. A party has not the absolute right to compel his opponent to submit to a physical examination; and a court will order such examination only when the necessities of the case require it, and when it can be made without danger to the party's life or health, and without the infliction of serious pain. Consult Watson, *On Damages for Personal Injuries* (Charlottesville, 1901).

EX'ANTHE'MA (Lat., from Gk. *ἐξάνθημα*, eruption, from *ἐξανθεῖν*, *exanthein*, to blossom out, from *ἐκ*, *ek*, out + *ἄνθος*, *anthos*, flower). A name applied to a class of febrile diseases (exanthemata) attended by distinctive eruptions on the skin, appearing at a definite period, and running a recognizable course. To this class belong smallpox, chickenpox, measles, German measles, typhoid fever, scarlet fever, typhus, and erysipelas (qq.v.). See FEVER.

EX'ARCH (Lat. *exarchus*, from Gk. *ἔξαρχος*, *exarchos*, leader, from *ἐξάρχειν*, *exarchein*, to lead out, from *ἐξ*, *ex*, out + *ἄρχειν*, *archein*, to lead). A title applied early in the sixth century to any officer in the Byzantine army, but restricted in the last decade of the century to the military governors in Italy and Africa. Because of the troubled conditions in those two countries the exarch had to be given absolute civil as well as military power. The Exarch of Italy, who resided at Ravenna (q.v.), ratified the election of the Bishop of Rome, controlled the finances, judged all appeals, and made all official appointments. For the end of the exarchate in Italy, see AISTULF. In the Christian Church exarch was originally a title of the bishops, afterward of a bishop who presided over several others—a primate. After the Council of Chalcedon it was used as a title higher than metropolitan, but lower than patriarch. The exarch of monasteries was an official charged with the maintenance of discipline. The same title is also borne, in the modern Greek church, by the person who "visits" officially, as a legate of the patriarch, the provincial clergy and churches. Consult Diehl, *Etudes sur l'administration byzantine dans l'exarchat de Ravenne* (Paris, 1888), and Ducange, *Glossarium ad Scriptores Mediæ et Infimæ Græcitatis* (Paris, 1688).

EXARCH. See *Vascular System*, under MORPHOLOGY OF PLANTS.

EXCAL'IBUR. The famous sword of King Arthur (q.v.). It was bestowed upon him in accordance with the promise of Merlin, by the Lady of the Lake, and at his death thrown by one of his faithful knights back into the waters of the lake, where it was grasped and borne beneath the surface by a mystic hand. Consult Tennyson's *Idylls of the King*.

EX CATH'EDRA (Lat., from the chair). A phrase originally used with reference to the decisions of the Pope or others high in authority, who, literally speaking, pronounced their judgments *ex cathedra*. The expression is often used generally, meaning to speak with complete authority. In the definition by the Vatican Council of papal infallibility the expression is used as one of the limitations of the doctrine. The Pope is held to be infallible only when, among other things, "he speaks *ex cathedra*, i.e., when in the discharge of his office of pastor and teacher of all Christians, in virtue of his supreme apostolic authority, he defines a doctrine regarding faith or morals to be held by the whole Church."

EXCAVATING MACHINERY (from Lat. *excavare*, to hollow, from *ex*, out + *cavare*, to hollow, from *cavus*, hollow). This term embraces mechanical devices for excavating and loading earth used in the construction of railways, canals, reservoirs, etc. The two most important classes of excavating machines are dredges and steam shovels, which are described under those titles. The ordinary drag scraper is one of the simplest forms of excavating machine; wheel scrapers are, roughly speaking, drag-scraper bodies mounted on two wheels to facilitate their movement. Drag and wheel scrapers, which may be modified in various ways, usually are hauled by horses and require a man to load and dump them. Scrapers of large size are sometimes arranged to be operated by cables, the cables being so arranged and so manœuvred by a steam engine that they automatically fill, haul, dump, reverse, and return the scraper just as these operations are performed by hand and horse power. A form of excavating machine called a grader, which is much used, consists of a four-wheeled vehicle with a strong frame from which a peculiar form of plow is rigidly suspended. This plow turns the earth on to a traveling belt, which extends diagonally upward at one side of the vehicle so that a wagon may be driven under its upper end to receive the discharge. Grapple-bucket excavators and continuous chain-bucket excavators have been developed from dredges of this type and quite extensively used. Special forms of excavators with buckets designed for the material to be handled are in operation both in connection with traveling cranes and with cableways, and these are extensively used in all kinds of excavation. The grapple dredge usually has buckets of the orange-peel or the grab-bucket type, where two quadrants of a cylinder are so hinged that after being lowered into the material they may be brought together and then the load raised by another cable or chain. For ditching and trenching drag-line excavators are employed, with buckets of various types, as well as some form of continuous chain-bucket excavator which can be used in dry excavation as well as wet. See DREDGE; ROAD AND STREET MACHINERY; STEAM SHOVEL. Consult Merriman, *American Civil Engineer's Pocket Book* (2d ed., New York, 1913), and McDaniel, *Excavating Machinery* (New York, 1913).

EXCAVATION. A term applied to the removal of material in building or engineering operations, to provide space which may be or may not be filled with some sort of structural work. Excavation may vary from the simplest digging of a well or cellar for a rural dwelling to work involved in the construction of a ship-canal or railway terminal, tunnel subway, or subaqueous foundation. It may involve the use of pick and shovel or other hand tools, a horse-drawn plow or scraper, a steam shovel, or other forms of excavating machinery (q.v.) with or without the use of high explosives (see BLASTING), or various complicated dredging machinery. (See DREDGE.) Often it is a form of engineering where the element of human labor figures more prominently than elsewhere, as much of the work is done by hand, although this condition has been improved by recent forms of excavating machinery. The term *Excavation*, however, is so general a one that reference should be made to articles describing more important processes included under such titles as CANALS, DAMS AND RESERVOIRS, EXCAVATING MACHINERY, FOUNDATIONS, TUNNELS, DREDGE, RAILWAYS, ETC.

EXCEL′SIOR (Lat., higher). 1. The motto of the State of New York. 2. A widely known poem of Longfellow (1841), suggested by the motto of New York, and beginning "The shades of night were falling fast."

EXCELSIOR. A material formed of thin wood shavings, much used for packing purposes, stuffing for mattresses and upholstery, as stable and kennel bedding, and in France employed as a substitute for absorbent lint in hospitals, for filtration purposes, and for weaving into floor coverings. It was first made in the United States about the middle of the nineteenth century, being put on the market in 1860, but later the manufacture was extensively taken up in Europe, especially in France. Excelsior is not, as is often supposed, made from shavings, but directly from logs of wood. Aspen or poplar and basswood furnish the best material. The logs are first sawed into blocks, 19 inches long, 5 inches thick, and the width of the log. These bolts, or split billets, are seasoned, split in two 19-inch lengths, and the ends trimmed down to make the final bolt for the machinery 18 inches long, the usual length of a strip of excelsior. A knife shaves off the surface of the bolt, the slice first having been split by a series of scoring knives. The tiny fibres curl and commingle as they fall from the knife; the finer the shavings, the higher the grade of the product. An excelsior machine will make from 200 to 300 strokes a minute, each stroke cutting off a tier of fibres from the face of the block. Excelsior is packed in bales weighing 250 pounds. The annual production for the United States, amounting to some 140,000 tons, requires some 85,000,000 feet of timber, or the growth of over 14,000 acres of forest land. The American product in 1911 was manufactured by 122 factories, which consumed 142,944 cords of wood, of which 61,941 cords were cottonwood, 37,901 cords yellow pine, and 33,042 basswood. The price in 1914 varied from $8 to $22 per ton on the market according to the grade. It was said that it costs from $7 to $12 per ton to manufacture and market the product.

EXCEL′SIOR SPRINGS. A city in Clay Co., Mo., 28 miles northeast of Kansas City, on the Chicago, Milwaukee, and St. Paul, the Wabash, and the Kansas City, Clay County, and St. Joseph railroads (Map: Missouri, B 2). Its many mineral springs with medicinal properties have made the city a popular health resort. There are several fine hotels and pavilions, a large auditorium, Carnegie library, and a government building. The city has also an ice factory and bottling works. Pop., 1900, 1881; 1910, 3900.

EXCEP′TION (Lat. *exceptio*, from *excipere*, to except, from *ex*, out + *capere*, to take). In law: (*a*) a taking out or excluding something from the operation or effect of an instrument, statement, or the like; (*b*) an objection legally taken to testimony or other material matter in a legal proceeding; (*c*) the clause, writing, or statement by which either of these objects is accomplished, also the thing excepted or excepted to. When applied to a clause in a deed, it means a provision that exempts something from the grant, as where the deed conveys a certain farm with the exception of a described piece of land or a designated building or tree. (Cf. RESERVATION.) An exception in a statute exempts a person or thing from the operation of the enactment; and it is a rule of pleading in a criminal prosecution or in a civil suit for penalties under such a statute, that the indictment or complaint must negative the exception, i.e., deny that the defendant or the alleged criminal act comes within the exception. In admiralty and equity practice the term is applied to the proper method of bringing before the court an objection to the regularity or sufficiency of a pleading or proceeding. In this sense an exception partakes of the nature of a pleading, performing the function of a special demurrer at common law.

The term is employed most frequently, however, in common-law actions to describe the formal signification of a party's objection to an adverse ruling of the court upon some point of law. It must be taken at the time of the ruling, or within a prescribed period thereafter, and should be entered upon the court's record, so that a proper bill of exceptions (q.v.) may be prepared for a review of the case by an appellate court. Consult the authorities referred to under REAL PROPERTY; PLEADING; PRACTICE.

EXCESS (Lat. *excessus*, departure, from *excedere*, to depart, from *ex*, out + *cedere*, to go). The remainder arising from dividing one number by another is often called the excess, as in casting out nines in the test for divisibility. (See CHECKING.) In spherical trigonometry the excess of the sum of the angles of a spherical polygon over $n - 2$ straight angles (the sum of the angles of a plane polygon of the same number of sides) is called the spherical excess of the polygon; e.g., the spherical excess of a spherical triangle with the angles 90°, 127°, 40°, is 77°. When the area of a spherical triangle, compared with the area of the sphere on which it lies, is very small, it may be taken as the area of the plane triangle with sides of the same length as those of the spherical triangle and with angles diminished by one-third of the spherical excess. If S denotes the area of the spherical triangle, E its excess, and r the radius of the sphere, then $E = \frac{S}{r^2 \sin 1''}$. This formula is of use in triangulation (see SURVEYING) to check the excess as found from the observed angles.

EXCHANGE (OF. *exchanger*, *echanger*, Fr. *échanger*, It. *scambiare*, ML. *excambiare*, to exchange, from Lat. *ex*, out + ML. *cambiare*, Lat. *cambire*, to change, from OIr. *cimb*, tribute; connected with Gall. *cambos*, Ir. *camm*, Welsh, Corn., Brit. *cam*, crooked). In the older political economy, a division of the science including the treatment of value, price, money, credit, and also such topics as trade, domestic and foreign, transportation by land or sea, commercial policy, regulation of banking, and the like. In the recent development of economic science most of the topics mentioned above have been assimilated to production and distribution, and exchange, as a division of the science, has fallen into disuse. See POLITICAL ECONOMY.

EXCHANGE. The conversion of the money of one country into its equivalent in the money of another. The technical meaning of the word has now, however, come to be the difference between the actual value of money taken by the standard of bullion, in any two places, with relation to each other. If in New York it requires more than $500 to pay a debt of that amount in London, the rate of exchange is against the former town and in favor of the latter, an inhabitant of which can pay a debt of $500 in New York with less than that amount of bullion in London.

The operations of exchange are based on the principle of the cancellation of indebtedness and can be best explained by simple example. If a New York merchant, A, buys goods from a London merchant, B, it would seem that the simplest way of discharging his indebtedness would be by the shipment of gold to London. But this primitive method is not the simplest. Such a shipment involves costs of transportation and insurance, which materially enhance the price paid. A simpler plan would be to have another London merchant, C, who owes money in New York, make the payment in London to A's creditor, while A in New York makes the payment to C's creditor at that point. This is in effect what actually takes place in the settlement of such debts, though neither A in New York nor C in London is under the necessity of ascertaining to whom payment must be made to cancel the two debts. This is done through the agency of the banks and bankers. A in New York goes to his banker and buys a draft upon London; C in his turn buys a draft upon New York. These two drafts cancel one another, and London pays New York, and New York London, without the shipment of specie.

In order to correspond to the facts of the actual world, these simple transactions must be multiplied by the thousandfold. The aggregate of the payments to be made by New York to London must be balanced off against those of London to New York. But can it be supposed that the balance is ever exact? As between two points only, this is probably never the case. How, then, can a balance be reached? In the first place, by associating with New York other places which do their banking through that centre. In this manner practical equality of demand between points is attained, and exchange is at par. Costs of shipment are eliminated, and to pay a debt of £500 in London, the New York merchant pays the exact equivalent in American money of the fine gold contained in £500. But such equality of demand is rare. There is usually an excess of payments to be made by one point or the other. In such cases exchange rises above or falls below par. If New York has more payments to make upon London than London on New York, sterling exchange will be in demand. To secure the means of payment in London the New York merchant will pay more than the par, and exchange is at a premium. If the contrary case prevails, New York bankers in their desire to secure payments for London will offer them at less than par. The alternative of buying exchange is always the shipment of bullion, and when the premium upon exchange grows as large as the cost of shipping bullion, gold exports will begin. The cost of shipping bullion fixes, therefore, the maximum of exchange. In the last resort, therefore, the discrepancy in the relative demand of two points is liquidated by shipments of specie, but it is to be observed that it is only the balance which is shipped, and large amounts are settled by the principle of compensation. Before the shipment of specie takes place, various adjustments in trade are likely to occur that reduce the amount of specie to be shipped. When exchange on London is above par, the premium acts as a stimulus to exportation; when below par, a stimulus to importation is offered. Especially significant is the effect of changes in the rate of exchange upon the movement of securities, which often is sufficiently great to liquidate balances. In the general circle of transactions of this kind the state or town which has the largest amount of transactions will have the largest number of debtors and of creditors and will afford the chief facility for each compensating the other. It is thus that London is the centre of the money market, where all the debits and credits of the world may be said to meet and extinguish each other. While the old notions about the balance of trade (q.v.) existed, it was supposed that the nation which the exchange was against was going to ruin, while that which it was in favor of was prospering through the other's loss. At present it is inconvenient and expensive to a country to have the exchange against it. An adverse exchange generally indicates a sort of break in the circle of trade which it would be advantageous to fill up, and *may* be caused by the commerce of a country decreasing; on the other hand, however, the imports for which a country pays in cash or in expensive bills may be a highly advantageous traffic. Gold-producing countries find bullion their most advantageous export, and the same is the case with countries into which gold has flowed in excess.

Some confusion as to rates of exchange often occurs because of the failure to note the divergent practice of the London and other markets. In London they reckon how much foreign money can be purchased by a definite sum of the home currency. Thus, the par of exchange between London and New York being £1 = $4.866½, London may reckon exchange at $4.84, in which case American money is dear and exchange at a premium. On the other hand, New York reckons the cost in American money of a definite quantity of foreign money. Thus, when sterling exchange is quoted at $4.84, English money is cheap and exchange below par. Consequently, in England, exchange "falls" as the conditions become more unfavorable, while in the United States exchange "rises" when the conditions become unfavorable. A failure to note this difference has been a fruitful cause of misunderstanding. Consult: G. J. Goschen, *Theory of Foreign Exchange* (16th ed., London, 1894); C. A. Stern, *Arbitrations and Parties of Foreign Exchange* (New York, 1901); F. Escher, *Elements of Foreign Exchange* (ib., 1910); D. M. Barbour, *Standard of Value* (ib., 1912); A. W. Margraff, *International Exchange* (4th ed., ib., 1912); H. Withers, *Money-Changing* (ib., 1913).

EXCHANGE. A term applied to an organization of merchants meeting at stated times, generally daily, for the transaction of business, as well as to the building in which such meetings occur. Here and in Great Britain a sharp line is generally drawn between stock exchanges, at present the most important form of exchanges, and those devoted to other classes of transactions, but on the continent of Europe this is not the case. There the exchange focuses the commercial life of the community at one point, and accordingly the buildings devoted to the purpose are frequently among the architectural ornaments of the city, as in Paris and Brussels. Whether there is a single exchange or several, the kindred purposes of all such organizations have developed a particular type of building. There is generally a large quadrangular space surrounded by an arcade, frequently with offices opening from the latter. The central space, the "floor," devoid of furniture—transactions of large amount being carried in the head or on the simplest memoranda—is reserved for the accredited members of the organization, while the arcade, or gallery, as the case may be, accommodates visitors. Offices for the manager and his assistants, and frequently reading and recreation rooms for the members, form a part of the equipment of such a building.

Exchanges as organizations are of quite early date, and we have no precise record of their original purposes. It is probable that they grew out of the mediæval guilds of merchants. The latter erected their own warehouses, and in the regulation of their use and the determination of trading customs and settlement of disputes in such guilds we see types of the activities of the modern exchanges. Many of the latter were founded early in the sixteenth century, especially in the Netherlands. The Royal Exchange of London dates from 1556, when it was established by Sir Thomas Gresham. Wherever they exist exchanges are primarily organizations of merchants with more or less recognition and control by the government. In England and the United States they are simply private corporations chartered by the State, but on the continent of Europe the government takes an active part in their establishment and administration.

The main characteristic of dealings in exchanges is the fact that the goods dealt in are not physically present. There is not, as in the case of sales in a private establishment, opportunity for inspection of goods. It follows, therefore, that exchanges deal in standard goods only, or rather in such as may be definitely described. The purchaser of goods on an exchange does not buy specific goods, but rather a specific quantity of goods of a definite character. It is this feature which adapts the exchanges in so marked a degree to speculation. Persons buy and sell without contemplation of future delivery, but with reference to a future price. Settlements are expected and made, not by delivery of the goods, but by adjustment of the difference between the contract price and the price ruling in the market at the maturity of the contract.

Stocks, bonds, cotton, wool, grain, hides, provisions, and a few other commodities can be bought and sold in this fashion. Of these, the first and second are particularly adapted to such transactions, and stock exchanges are accordingly the most widely disseminated form of exchanges. In the United States separate exchanges generally exist for them, while the other commodities may be handled by a general produce exchange, or by separate organizations, depending upon certain historical antecedents or upon the importance of the staple in question for the trade of a particular place.

Stock exchanges and produce exchanges have many points of organization and procedure in common, but as stock exchanges are treated in a separate article, we shall confine our explanations here to produce exchanges, illustrating their methods and purposes by some account of the New York Produce Exchange.

This organization was originally chartered April 19, 1862, as the New York Commercial Association. Its purposes are declared by its charter to be "to provide and regulate a suitable room or rooms for a Produce Exchange in the city of New York, to inculcate just and equitable principles in trade, to establish and maintain uniformity in commercial usages, to acquire, preserve, and disseminate valuable business information, and to adjust controversies and misunderstandings between persons engaged in business." In 1868 an Act amendatory to the charter changed the name to the New York Produce Exchange, while a further Act of 1882 added to the declared purposes, "to make provision for the widows and families of deceased members." The conduct of the affairs of the organization is vested in a board of managers consisting of the president, vice president, treasurer, and 12 other managers elected annually by the association. The charter authorizes the board of managers to elect annually an arbitration committee composed of five persons not members of the board, whose duty it is to hear and decide controversies between members. On filing the award of the committee in the Supreme Court of the County and City of New York, judgment is entered according to the award. From such award there is no appeal except for frauds, collusion, or corruption of the arbitration committee or of its members. Other committees are named by the president. Of these, one of the most important is the complaint committee, which takes cognizance of all duly entered complaints against members. This body endeavors to conciliate the disputants or induce them to resort to arbitration. Failing in this, it may, if circumstances warrant, bring the matter before the board of managers, which may, when the charges against the defendant are substantiated, by vote of two-thirds of the members present, censure, suspend, or expel him from the exchange. Other important committees are that on trade, which has to do with commercial usages, and the committee on information and statistics. In addition to the managers and various committees there is a superintendent of the exchange charged with the details of management, the care of the building, and similar duties. Annual assessments of not less than $10 or more than $30, as the board may direct, form the basis of the revenues of the exchange.

In addition to general rules as to membership and the like, there is a series of special rules for the trade in provisions, lard, grain, flour, seeds, petroleum, oil, butter, cheese, and hops, maritime trade, and steamship trade. These rules have much similarity, though they differ according to the nature of the business in question. Each set of rules defines standard grades in the commodity to which it refers. Thus, in the rules governing the provision trade we find exact descriptions of what is meant by such familiar market terms as mess pork, prime mess pork, extra prime pork, and the like. The rules define also the quantities in which such goods shall be handled, and modes of packing and curing. They provide a system of inspection, and the board licenses inspectors to carry it out. Standard forms of contract, rules as to settlements, and similar matters are features of the rules. Far more complex are the rules governing the grain trade, but they do not differ in spirit.

Each exchange makes its own rules, such as are adapted to the locality in which it is situated, but for the same kinds of trade the rules have much in common. This is particularly true of all rules fixing definitions, as the various exchanges strive here especially to secure uniformity. An important function of all exchanges is the dissemination of information. Not only are the market reports published daily in the papers prepared under the supervision of the exchanges, but annual reports embracing a vast amount of statistical information are frequently published. See Stock Exchange; Speculation.

EXCHEQ'UER, Chancellor of the (OF. *escheker*, Fr. *échiquier*, checkerboard, alluding to the checkered cloth on which accounts were reckoned, from OF. *eschecs*, Fr. *échec*, chess, from Pers. *šāh*, OPers. *xšāyaθiya*, Skt. *kṣatriya*, king, from *kṣi*, to rule). In Great Britain, the head of the Treasury Department. He must be a member of the Lower House, which holds control of the purse. When the Prime Minister is a member of the House of Commons, he sometimes holds the office of Chancellor of the Exchequer. The judicial functions of the Chancellor, which before the eighteenth century were of great importance, have disappeared. See Exchequer, Court of.

EXCHEQUER, Court of. An English law court of great antiquity and importance, originally instituted for the adjudication of controverted questions relating to the royal revenues. It is said to have existed from the early times of the Conquest and is supposed to have been denominated the Exchequer from the fact that a checkered cloth was wont to be laid upon the table of the court. Under the Norman kings it was a branch of the *Aula Regia*, or Great Council of the Nation. From the reign of Henry III its existence as a separate court was recognized. Its special business continued to be the decision of revenue cases, but from an early period the court showed a tendency to extend its jurisdiction over the ordinary litigious business—the common pleas—of the country. This was done by establishing the fiction that all lieges were the crown's debtors, whereby the Court of Exchequer acquired a concurrent jurisdiction with the other courts of common law. Besides its common-law jurisdiction the Exchequer was distinguished from the two other superior courts of common law—the King's Bench and the Court of Common Pleas—by having an equity side; but this was abolished in 1841, and its equitable jurisdiction transferred to the Court of Chancery. The judges of the Exchequer consisted originally of the Lord Treasurer, the Chancellor of the Exchequer, and three puisne judges (these last being called barons of the Exchequer). The Chancellor of the Exchequer sat only on the equity side of the court; he has not been called upon to exercise his judicial functions since 1735. The Court of Exchequer was abolished as a separate court by the Judicature Act of 1873, and its jurisdiction transferred to the newly created High Court of Justice. See Baron; Curia Regis.

The Court of Exchequer Chamber was formerly a court of all the judges in England assembled for decision of matters of law. Originally established in the reign of Edward III, for the purpose of reviewing the decisions of the common-law side of the Court of Exchequer, it developed into a general court of error, in which capacity it revised the judgments of the other two courts of common law as well. In the reign of Elizabeth it was enacted that the judges of the Common Pleas and Exchequer should form a second Court of Exchequer Chamber, for review of certain cases in the Queen's Bench. But this intermediate court of appeal was abolished by the Judicature Act of 1873.

In Scotland, before the Union, the *Exchequer* was the King's revenue court. A new court was established in the reign of Queen Anne having a private jurisdiction as to questions relating to revenues and customs of excise, and as to all honors and estates, real and personal, and forfeitures and penalties arising to the crown within Scotland. The judges of the court were the High Treasurer of Great Britain, the Chief Baron and four other barons, and English barristers as well as Scottish advocates were allowed to practice in the court. By a statute of William IV it was provided that successors should not be appointed to such of the barons as should retire or die, and that the duties of the court should be discharged by a judge of the Court of Session. More recently, by 19 and 20 Vict., c. 56, the Court of Exchequer has been abolished and its jurisdiction transferred to the Court of Session.

The Court of Exchequer Chamber in Ireland was established by 40 George III, c. 39, but was abolished as an intermediate court of appeal between the Irish courts and the High Court of England. (See Court.) Consult Madox, *History and Antiquities of the Exchequer of the Kings of England, etc.* (2d ed., London, 1769); Poole, *The Exchequer in the Twelfth Century* (ib., 1912).

EXCHEQUER BILLS. Notes issued by the English Treasury or Exchequer for the purpose of supplying a temporary demand for money. Such bills were issued to meet temporary emergencies, with the expectation of repayment in a comparatively brief period. They bore interest and were payable at the option of the government. At times they have been liquidated by payment from current revenues; at other times by conversion into funded debt. While the bills have some of the features of investments, they are, on the other hand, receivable at the public Treasury in payment of taxes, and the rate of interest upon them has been variable, according to the condition of the market at the time of issue. They were first introduced into England in the reign of William III and have since been a conspicuous feature in English financial policy. Of late years, however, they have been generally superseded by the issue of Exchequer bonds. These differ from the bills in having a definite time to run, but otherwise they serve the same purpose. While the United States has issued in the past quarter of a century no obligations in any way analogous to the Exchequer bills and bonds, there are some striking points of resemblance between the latter and the Treasury notes which were a frequent device of American financiering before the outbreak of the Civil War. See Treasury Notes.

EXCHEQUER TALLIES. Seasoned wands of ash, hazel, or willow, formerly used for checking accounts in the English Exchequer. The sum acknowledged was inscribed on the tally, on the other side of which the same sum was inscribed in Roman characters, together with the payer's name. Notches marked upon the tally indicated by their form the class to which the account belonged. This tally was split, and the payer received one-half, which he presented for payment, and which was matched with the half remaining in the office.

EXCIP′IENT (from Lat. *excipere*, to take out, from *ex*, out + *capere*, to take). An inert or slightly active substance, introduced into a medical prescription as a *vehicle* or medium of administration for the strictly medicinal ingredients or to make up the necessary bulk. Thus, conserve of red roses, or bread crumbs, or licorice powder is used to make up pills; white sugar in medicinal powders; water, mucilage, white of egg, sirup, glycerin, and many other substances in fluid mixtures.

EXCISE, ĕx-sīz′ (MDutch *aksiis*, *aksys*, Ger. *Accise*, excise, from OF. *assis*, taxes, from *assise*, session, from *asseir*, Fr. *asseoir*, to sit, from Lat. *assidere*, to sit, from *ad* + *sedere*, Gk. ἕζεσθαι, *hezesthai*, Skt. *sad*, to sit; confused by popular etymology with Lat. *excisus*, p.p. of *excidere*, to cut off). A term commonly applied to a tax on commodities, levied either upon production or upon sale. In American finance the term is occasionally applied to taxes of an entirely different nature, as, e.g., to the corporation tax of 1909. A tax on commodities bought and sold is a very obvious one, but it has generally appeared in the simple shape of a toll on goods brought to market, and the complicated arrangements for officially watching the process of a manufacture for the purpose of seeing that none of the dues of the revenues are evaded is of comparatively modern origin. Though a tax corresponding to the excise appears to have been occasionally levied in England in very early times, the name first appears in the act of the Long Parliament establishing an excise on liquors, in 1643, with the promise of repeal at the end of the war. But when the land tax was removed or greatly diminished, and revenue from that source was no longer sufficient, it was found impossible to dispense with this new method of supply to the Treasury. Though always unpopular, the excise in some form or other has ever continued to be a material element in the taxation of Great Britain.

In the United States the term "excise" is comparatively unfamiliar. The taxation which corresponds to the English excise is known as internal-revenue taxation. See Internal-Revenue System.

An excise, when compared with other taxes, has its good and its bad features; it is a method of extracting money for national purposes by taxing expenditures on luxuries and is especially serviceable when fed from those luxuries the use of which in excess becomes a vice. On the other hand, it renders necessary a system of inquisitional inspection, while the manufacturer is at times obliged to employ a more expensive and inconvenient process and to forego the introduction of improvements in order to conform to governmental regulations, the cost of such unnecessary labor falling eventually upon the consumer. Moreover, checking the demand by artificially raising the price of a commodity in this way may often retard the growth of a rising industry. Though counteracted in a measure by the bonding system, the necessity of a larger capital for the manufacture of excisable articles fosters a sort of monopoly by its tendency to check competition; and since the manufacturer must realize profits on that part of his capital which is applied to the payment of taxes, as well as what is directly employed in the production of the article, the price to the consumer is greatly increased. These objections do not, however, invalidate the advantages of the excise system in this country, where the luxuries, spirits and tobacco, bear the chief burden of the tax; and it is the common opinion that a low excise on articles of luxury is the most productive as well as the least objectionable of taxes. See Finance; Stamp Act; Stamps; Tax.

EXCI′TANT (from Lat. *excitare*, to excite, from *ex*, out + *ciere*, to call), or Stimulant (from Lat. *stimulare*, to stimulate, from *stimulus*, goad). Any pharmaceutical preparation which, acting through the nervous system, tends to increase the action of the heart and other organs. Examples of cardiac excitants are strychnine, caffein, and alcohol, in small doses. Among the respiratory stimulants ammonia is the most useful and powerful. Externally mustard and other rubefacients are employed. The class is a very numerous one, and must be used with discrimination.

EXCI′TO-MO′TOR ACTION. See Nervous System.

EXCLUDED MIDDLE, The Law of the. The logical principle that, of two contradictory propositions, both cannot be denied. One of the two must be affirmed. See Opposition.

EXCLU′SION BILL. See Charles II; James II.

EX′COMMU′NICA′TION. Exclusion from religious privileges; usually used of exclusion by formal sentence from the fellowship of the Christian Church. The ancient Romans had something analogous in the exclusion from the temples and from participation in the sacrifices of certain persons who were given over with awe-inspiring ceremonies to the furies. In the time of Christ it was a recognized penalty among the Jews (see John ix. 22; xii. 42; xvi. 2). A distinction is drawn in the Mishna between two degrees of excommunication; of these, the milder (*niddui*) involved exclusion from the life of the community for 30 days (or seven days), with the performance of penances and the wearing of mourning apparel. Twenty-four causes are enumerated, most of them of a civil nature. The heavier sentence (*cherem*) was pronounced with great formality of solemn curses and was for an indefinite time. A similar power was recognized from the first in the Christian Church (see Matt. xviii. 17; 1 Cor. v. 5; 1 Tim. i. 20) and is frequently referred to in the fathers. There were two forms of excommunication, medicinal and mortal—i.e., healing or reformatory and damnatory. The two degrees of excommunication, major and minor, were early distinguished. Minor excommunication involved exclusion from the sacrament of the Lord's Supper and from the full privileges of the Church. Major excommunication was pronounced upon obstinate sinners, relapsed offenders, and heretics. Its form was usually more solemn and the decree not so easily revoked. The term of the excommunication was left to the bishop. (See ABSOLUTION.) In Africa and Spain the absolution of lapsed persons —i.e., those who in times of persecution had yielded and fallen away from their Christian professions by actual sacrifice to idols—was forbidden except at the hour of death, unless by the special intercession of martyrs. At first no civil disabilities were connected with excommunication, but as governments became Christian, major excommunication was followed by loss of political rights and exclusion from public office. The capitularies of Pepin the Short, in the eighth century, ordained that major excommunication should be followed by banishment. Other national laws still further extended the scope of the ecclesiastical censure. By a logical consequence a sentence of excommunication directed against the ruler deprived him of his rights to govern and by that fact absolved his subjects from their allegiance to him. When such a purpose was intended, however, a special sentence to that effect was attached to the bull of excommunication. The reformers claimed the power of excommunication in the same degree as the church from which they seceded. Luther, as may be seen from the *Table Talk*, insisted on the right of excommunication as inherent in the ministers of the church. Calvin (see the *Institutes*, iv, xii) asserted that excommunication is of the very essence of the ministry. At first civil disabilities, as in Geneva, followed excommunication in reform communities. Later this ceased to be the practice. Nevertheless in England, until 1813, persons excommunicated were debarred from bringing or maintaining actions, from serving as jurymen, from appearing as witnesses in any cause, and from practicing as attorneys in any of the courts of the realm. All these disabilities were removed by statute (53 Geo. III, c. 127), and the excommunicate were declared no longer liable to any penalty, except "such imprisonment, not exceeding six months, as the court pronouncing or declaring such person excommunicate shall direct." By the laws of the United States excommunication cannot involve the loss of civil rights, and the civil courts cannot be used to enforce the restoration of church membership.

Anathema differs from excommunication only in that it includes certain formal ceremonies and requires a solemn reconciliation. There was some doubt on this point until the definition of the Council of Trent. In the Catholic church the power of excommunication belongs to those who possess ordinary or delegated jurisdiction in the external forum, but only in regard to those subject to them. Parish priests who have jurisdiction only in the *forum internum* cannot excommunicate, and the power can never be delegated to laymen. Bishops, within their sees; archbishops, while exercising visitatorial jurisdiction; heads of religious orders, within their own communities, all possess the power to issue excommunication. The subjects of excommunication can be only Christians, alive and of sound mind, guilty of a grave offense and persisting in it, and subjects of the judge giving sentence. The supposed excommunication of the dead was merely a declaration that the deceased had, *while living*, been guilty of some crime to which *excommunication is attached by the church laws*. The sentence of excommunication may be justly inflicted on heretics or schismatics. Excommunication may be incurred without the necessity of formal sentence. For some acts a person may be excommunicated, but does not actually incur the sentence unless it is pronounced by a competent judge. For other faults, however, the words of the law are that upon a given act being done the doer of it falls at once under the ban of the church, the phrase usually employed being "Let him incur excommunication *ipso facto*." These are the excommunications *latæ sententiæ*, so called. Absolution from certain excommunications is reserved to the Pope. Those under major excommunication fall into two classes— the tolerated, whom the faithful are not bound to avoid, and the nontolerated—i.e., those excommunicated by name and publicly denounced —with whom the faithful are forbidden to hold either religious or civil communication. The latest papal deliverance on this subject is the Bull *Apostolicæ Sedis*, issued by Pius IX, Oct. 12, 1869. This permits civil intercourse, even with persons under major excommunication, for the sake of the faithful themselves, unless in very exceptional circumstances and with regard to specially designated persons. The formula of excommunication from the anonymous appendix to Marculphus cited in *Tristram Shandy*, and often quoted as the actual formula employed by Roman Catholic authorities, is a forgery and has never been employed. Consult: Von Kober, *Der Kirchenbann* (Tübingen, 1857); Schilling, *Der Kirchenbann nach canonischen Recht* (Leipzig, 1859); and Taunton, *The Law of the Church* (London, 1906). For a description of the formula used, see BELL, BOOK, AND CANDLE.

EXCRE'TION (Fr. *excrétion*, from Lat. *excernere*, to separate, from *ex*, away + *cernere*, to separate). In animal and plant physiology, the process by which materials of no further use in nutrition are separated from the protoplasm and rejected by the body, and the substances so separated. This process is similar to that of secretion (q.v.). See FÆCES; URINE; SWEAT.

EX'CRETORY SYSTEM, COMPARATIVE ANATOMY OF THE. The organs whose function it is to remove from the animal body both the waste products of metabolism and the excess of other substances that occur in the blood. Not only are the products resulting from the metabolism of proteids separated from the blood, but the blood is kept at its normal standard by the excreting organs. They remove both the qualitative and quantitative excess of any substance in the blood. The excretory organs may be likened to discriminating strainers. Of two substances equally soluble in the blood, such as sugar and urea, the urea is extruded by them and the sugar retained, while such insoluble substances as resin are removed by the vertebrate kidneys. The excretory organs of vertebrates are primarily the kidneys. The skin and lungs likewise function to some extent as eliminating organs. The lungs, however, are both organs of nutrition and excretion, for while they take in oxygen, so necessary for the animal welfare, they throw out carbonic-acid gas, which is a poison to the animal body, and free the body from other excrementitious substances. The whole surface of the skin functions to some extent as an excreting organ, for considerable water, salts, and fats are expelled by the skin. The waste products produced by the breaking down of nitrogenous substances, and which contain nitrogen, such as uric acid and urea, are separated from the blood and discharged from the body by another set of organs, known as the renal organs or kidneys. These organs vary greatly in form and function throughout the animal kingdom.

Protozoa. The simplest excretory organ is the contractile vacuole found in the Protozoa, but little is known concerning its function. In certain Infusoria fine lines or spaces radiate out from the central part of the vacuole into the substance of the organism, and through them the waste substances are drained into the vacuole. The contents of the vacuole either burst to the exterior or are cast out forcibly through the body wall by the contraction of the walls of the vacuole.

Flatworms. Organs that have an undoubted excretory function are first met with in the flatworms (Platyhelminthes). They are known as the water-vascular system. This system consists, in *Planaria*, of two lateral coiled trunks, one on the right and one on the left side of the body, from which many side branches ramify through the tissues of the body. These tubes open on the dorsal surface of the body by means of several minute pores. The fine lateral branches subdivide so as to give rise to still finer capillary vessels. Each of these latter may terminate in a flame cell. The flame cell is nucleated and contains a vacuole or space in communication with a capillary. The vacuole contains one or more vibratile cilia, whose flickering motion, like that of a candle flame, has given rise to the term "flame cell." A respiratory function has also been maintained for this system. The excretory system of the liver fluke consists of one main trunk, which terminates anteriorly in four large branching trunks. The latter eventually lead into flame cells. Posteriorly the main trunk ends in an excretory pore. In the tapeworm there are four longitudinal water tubes, which extend throughout the entire length of the worm. At the posterior end of each proglottis they are connected by a transverse tube. At the posterior end there is a pulsating caudal vesicle which opens to the exterior. As in the planarian, so in the tapeworm the main trunk gives rise to dendritic branches which end in flame cells. The lateral tubes of nematodes and rotifers end in a common duct or a contractile vessel, respectively, posteriorly, and in flame cells at the other end.

Echinodermata. It is maintained by some authorities that the water-vascular system of Echinodermata helps to get rid of waste products. (See ECHINODERMATA.) The real function of this system is little understood. It probably subserves more than one function.

Brachiopoda. In the brachiopods there is a pair of nephridia lateral to the intestine. Each is funnel-shaped and opens into the body cavity by means of a plaited nephrostome and outwardly into the mantle cavity by means of a narrow curved portion.

Annulata. The organs that are considered to be excretory in the segmented worms are known as the segmental organs, or nephridia. They consist of a pair of tubes which are repeated in most of the annelids in nearly every segment of the body. There is only one such pair of tubules in *Sipunculus*, and in some other worms they are not found in a few of the most anterior and posterior segments of the body. A nephridium consists of a long tube coiled in a complicated manner. Each tube ends anteriorly in a ciliated funnel. The funnel connects with the cœlom, or body cavity, of the segment just anterior to the one in which its coiled tubule lies and in which the tubule communicates with the exterior by a ventral, contractile opening. In the earthworm a part of the lumen of the tubule is intracellular, like the flame cells of *Scoleoida;* i.e., it is formed by the perforation of a strand of cells. The thicker portion of the tubule is lined with cells, hence this portion of the lumen is intercellular.

Crustacea. The excretory system of Crustacea shows little relationship either with that of annulates or with insects. In larval Crustacea two sorts of so-called excretory organs are present. One pair of these organs lies at the base of the antennæ and is known as the antennary glands—the "green gland" of the crayfish. The other pair comprises the so-called "shell glands" which open at the base of the second maxillæ. In the course of the development of the Crustacea one pair atrophies. The Entomostraca retain the shell gland, and the Malacostraca the antennary gland. In the Stomatopoda, of which *Squilla* is an example, the renal excretion is poured through a pair of glandular tubes into the rectum. In the amphipods the excretory function is assigned to the cœca at the posterior end of the mesenteron. The shell gland of some of the Cirripedia is said to open like a true nephridium into the body cavity.

Peripatus possesses paired nephridia much like those of annulates. They open at the basal and lower surface of the legs. The fringed funnel of each nephridium opens either into the body cavity or into a closed sac. The development of the salivary glands, anal glands, and reproductive ducts shows that they are modified nephridia.

Hexapoda. The excretory system of insects is well developed, but bears no relation to that of annulates. There are no nephridia, but in connection with the proctodæum (hind-gut) there are from two (some Lepidoptera) to 150 (bee) fine tubes or solid threads, the Malpighian tubes, which twine about in the abdominal cavity. To these organs has been ascribed the excretory function, since uric acid is contained within them. In the Orthoptera these tubules may be united with a common duct.

Mollusca. A pair of kidneys or excretory organs are always present in the Mollusca. In many forms they are symmetrically arranged, one in each half of the body. These organs communicate with the body cavity by means of a wide opening (frequently a ciliated funnel), and with the exterior by means of a small opening. In these respects they correspond with the annelidan segmental organs, and probably they are homologous with a pair of such organs. These mesonephridia are situated just below the pericardium, with which the kidney portion of the organ also communicates. Besides the glandular kidney part there is usually a ciliated bladder portion. The cilia create an outward-flowing current. The molluscan kidney is known as the organ of Bojanus, in honor of its discoverer. In addition there is a gland known as Weber's organ, which lies in front of the pericardium. It discharges its secretion into the pericardium and is considered to have an excretory function. The nephridia of gastropods open directly to the exterior or by a ureter near the anus. The right organ is the larger, or in some cases is the only one to be developed. In the pearly nautilus there are four renal organs. In the squid and nautilus the glandular portion of the kidney follows along the right and left branchial veins.

Chordata. *Balanglossus* has a very slightly developed excretory system. Two ciliated funnels pass to the exterior in the region of the collar, but no nephridia are known. The proboscis gland has been thought possibly to have an excretory function, but apparently it does not open to the exterior. In tunicates the excretory function has been ascribed to a mass of clear vesicles in the loop of the intestine. In them uric acid is present. The so-called subneural gland may possibly also have secretory function. In *Amphioxus* Boveri has discovered about 90 pairs of nephridia. They are short tubes and open into the atrial cavity by a single opening for each tubule. The other end is in communication with the body cavity by means of a variable number of funnels. Ray Lankester, Hatcheck, and others have described other tubules in different regions of the adult or larva whose function is in doubt. Likewise on the floor of the atrial chamber there are groups of cells which have been called renal papillæ.

Craniata. The urinary system of vertebrates is so intimately connected with the reproductive system that the two systems are frequently considered together under the title *urinogenital system* or *organs*.

The excretory organs of vertebrates are much more complicated than any we have so far considered. In its most highly developed form the vertebrate excretory system consists of three sets of organs. The first set to arise, both in phylogenetic and ontogenetic development, are known as the *pronephros*, or "head kidneys." Usually they arise in a more anterior position than the other kidneys. In position as well as in several other respects they correspond to the segmental tubules of amphioxus. They are segmentally arranged like those of amphioxus and annulates, but they are much fewer in numbers. They arise in the mesoderm of the anterior end of the cœlomic wall, and each tubule opens into the cœlom by a ciliated funnel. They differ from the tubules of annulates and amphioxus, however, in that each tubule does not open directly to the exterior, but pours its secretion into a common duct—the *segmental duct*—which in turn discharges into the cloaca. It has been suggested that the segmental tubules formerly poured their contents into a longitudinal groove situated on the exterior. By the sinking of the groove beneath the surface a tube was formed. The embryonic development of this duct gives little light as to its origin. In some cases it is formed by a growth backward from the pronephros. In others the mesoblast or even the hypoblast seems to take an active part in its formation. The head kidney is said to be the functional excretory organ in the fish *Tetrasfer* and some of the other bony fishes. In *Myxine* and *Bdellostoma* it persists throughout adult life, although evidently in a somewhat degenerate condition; while in all the higher vertebrates except turtles and crocodiles it is rudimentary even in embryonic life.

The head kidney then is present at some stage in the development of all vertebrates, although its appearance may be very fleeting in some forms, and it may be so rudimentary in others as never to be functional. When the head kidney is functional, the *mesonephros*, or "middle kidney," appears later in larval development than in the cases in which the pronephros is only rudimentarily developed. The mesonephros consists of another series of tubules, developed from the mesoblast and usually in a position posterior to that of the head kidneys. These tubules likewise become connected with the segmental duct. Below the *Amniota* this, the Wolffian body, is the permanent kidney. Upon the appearance of the mesonephros the nephridia of the head kidneys lose their connection with the segmental duct. The tubules of the mesonephros also open into the body cavity by ciliated funnels. The funnels are not always present. They are in intimate relation with a glomerulus from the aorta. In selachians Paul Meyer and Rückert have observed vessels which connect the dorsal aorta with the subintestinal veins. Such a blood supply corresponds more nearly with that afforded by the segmental organs of the amphioxus.

In many forms the segmental duct seems to divide, or at least two ducts appear side by side. One retains its connections with the kidney tubules and is known as the Wolffian duct. The other, the Müllerian duct, opens into the body cavity on the one hand and as the oviduct serves to convey the eggs to the exterior. In the male the Wolffian duct becomes the genital duct. In the higher vertebrates still a third or permanent kidney arises posterior to the mesonephros and is known as the metanephros. This is the "kidney" of the higher vertebrates. The permanent kidney consists of coiled tubules, but a nephrostome is never present. Capillaries, forming glomeruli, are also present. The duct, the ureter of the permanent kidneys of higher vertebrates (from reptiles to man), is formed from a diverticulum which grows forward from the posterior end of the Wolffian duct and connects with the posterior nephridia.

The urinary bladder of fishes is formed by a diverticulum of the ureter, while in higher vertebrates it arises from the basal portion of the allantois.

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EXCUR'SION, The. A didactic and descriptive poem in blank verse, by Wordsworth, originally intended as a part of *The Recluse*, never completed. It appeared in 1814.

EXE, ĕks. A river rising in Exmoor, in West Somersetshire, England (Map: England, C 6), only 4 miles from the Bristol Channel. It flows 19 miles southeast to the borders of Devonshire, and then 35 miles south through that county, past Tiverton and Exeter, into the English Channel at Exmouth.

EXECUTION (Lat. *executio*, performance, from *exequi*, *exsequi*, to carry out, from *ex*, out + *sequi*, to follow; connected with Gk. *ἕπεσθαι*, *hepesthai*, Lith. *sekti*, Skt. *sac*, Av. *hac*, to follow, Goth. *saikwan*, Icel. *sjā*, OHG. *sehan*, Ger. *sehen*, AS. *sēon*, Eng. *see*). The enforcement, by the duly constituted authorities, of a final judgment, order, or decree of a court of justice. In strictness, the term has reference only to the enforcement of the process of the common-law courts, whether in civil or in criminal cases, and is not applicable to the procedure for carrying into effect the decrees of the equity courts. This is due to the radical difference in the jurisdiction exercised by the two classes of tribunals. A judgment in a court of law is merely an adjudication of the rights of the contending parties, declaring that one is or is not entitled to specific property or to a sum of money. In itself considered it has no further force and is ineffectual until enforced by distinct process, and this is furnished by the writ of execution, addressed to the administrative officers of the county, and by the proceedings taken thereunder. A court of equity, on the other hand, acts in personam; i.e., its decree is directed to the person against whom the proceeding is brought and binds him directly without further process. The machinery of the court is sufficient to enforce its decrees without calling upon the administrative officers of the county or the state to carry them into effect. However, in those cases in which the decree in equity directs the delivery of specific property or the payment of a sum of money, the process of execution is coming to be employed for carrying it into effect.

Execution on civil process is generally accomplished by the seizure of the judgment debtor's property or person. In England the subject is now regulated almost entirely by the rules of the Supreme Court. These declare that the term "writ of execution" shall include the common-law writs of fieri facias, capias, elegit, sequestration, and attachment (qq.v.); and they provide for the form as well as for the manner of issuing and enforcing each of these writs.

In this country the form of executions and the method of issuing and enforcing them are quite various. The statutes and court rules of each State must be consulted for the procedure therein, and the Federal statutes and court rules for the procedure in Federal jurisdictions. In general terms it may be said that, a final judgment having been rendered, the attorney for the judgment creditor is authorized to issue a writ of execution to the sheriff, marshal, or similar administrative officer, commanding him to seize and sell property of the judgment debtor sufficient to pay the judgment with interest as well as the officer's fees and expenses. In certain cases, usually those where the judgment debtor has been guilty of some fraud or violence or other misconduct, an execution may be issued against his body, commanding the officer to seize and imprison him until the judgment is paid. This is commonly known as a "body execution." Certain property of the judgment debtor is exempted by statute from execution. This includes, as a rule, a small amount of household furniture, of food, and fuel for his family, of wearing apparel, of books, tools, and implements of trade, and the like. Here, again, the statutes applicable to a particular case must be consulted. Consult Edwards, *Law of Executions* (London, 1888), and Freeman, *Treatise on the Law of Executions in Civil Cases* (3d ed., San Francisco, 1900). See Debtor.

Execution in criminal cases is the enforcement of a sentence or judgment duly pronounced by a court. If the judgment is for other than *capital punishment* (q.v.), a certified copy of its entry upon the minutes of the court is generally required to be furnished to the officer whose duty it is to enforce it, and no other warrant or evidence of authority is necessary to justify its execution. If the criminal is sentenced to the punishment of death, a warrant, signed by the judge presiding at the trial, is ordinarily delivered to the sheriff or similar officer, appointing the time and describing the manner of the execution. Formerly criminal sentences were executed publicly and often were revolting exhibitions of cruelty. The modern tendency throughout Christendom has been to abolish the publicity and to minimize the cruelty of criminal executions. Consult the authorities referred to under the titles Criminal Law; Sheriff; Capital Punishment; etc. See Punishment; Capital Punishment; Drowning; Electrocution; Guillotine; Hanging; Maiden; Murder; Newgate; Parricide; Peine Forte et Dure; Treason; Tyburn; Wheel, Breaking on the; etc.

EX'ECU'TION, Military. In a legal sense, the carrying into effect the sentence of a military court, as the "execution of the sentence." (See Military Law.) In the manual of drill regulations, commands are of two kinds—preparatory commands and commands of execution. The latter causes the execution of the former. In the command "1. *Forward;* 2. *March,*" the word "march" is the command of execution.

EXECU'TIONER. The official who inflicts capital punishment. In early times, both among the Romans and the Teutonic peoples, a distinction was made between two aspects of the function. In Rome the lictors executed sentences passed on citizens, while an official called *carnifex,* whose office was considered degrading, crucified or tortured slaves and foreigners. In primitive Germany the carrying out of the sentence usually fell either to the community from which it proceeded or to the accuser and his friends—a custom which in some places prevailed as late as the sixteenth century, although the counts of the Frankish monarchy had their official jailers and hangmen. Sometimes the youngest bailiff, or the youngest married man, was bound to carry out the sentence; in other cases one of the criminals was allowed to purchase his freedom by acting as executioner. In the towns sentence of death was usually executed by a subordinate official. In times of more definite organization another distinction was made between the *Scharfrichter,* who beheaded the victim without the necessity of personal contact, and the *Henker,* usually his subordinate, who carried out sentences of hanging, burning, quartering, and torture. The office of the former was expressly declared by law to imply no degradation, but popular feeling turned with disgust from it and required its bearer to occupy a designated place in church and to present himself last of all for communion.

Like many other offices, that of executioner seems to have been at one time hereditary in England, as in several German states, certain families being thus, as it were, condemned to perpetual infamy. In some parts of England the office was annexed to other posts; thus, the porter of the city of Canterbury was executioner for the County of Kent in the time of Henry II and Henry III, for which he had an allowance of 20 shillings a year from the sheriff, who was reimbursed by the exchequer. The sum of 13 pence halfpenny was long popularly spoken of as "hangman's wages," such a sum, equivalent to a merk Scots, having been the fee for each performance.

From Gregory Brandon, the London executioner in the reign of James I, the name Gregory was employed as a familiar designation for the profession in general. Brandon managed to procure from the Heralds' College a coat armorial and became an esquire by virtue of his office. One of his successors, Dun, is referred to in Butler's *Ghost*, published in 1862:

> "For you yourself to act 'Squire Dun,'
> Such ignominy ne'er saw the sun."

He was succeeded by John or Jack Ketch, commemorated by Dryden (*Epilogue to the Duke of Guise*), and his name has since been synonymous with hangman. All parts of England have in recent times depended upon the London executioner for the actual hanging. Calcraft and Marwood have been the best-known holders of the office in modern days. The Parisian executioner is familiarly styled Monsieur de Paris. The Sanson family have been the most distinguished bearers of this title. (Consult *Memoirs of the Sansons*, London, 1875.) It was one of this family who officiated at the execution of Louis XVI.

In all the American States a provision is made for such an official, but the title and duties differ in each. In many of the States the sheriff is the executioner in his particular county; but in large States like New York, where a State prison exists, the warden of that institution is technically, not practically, the executioner. In the United States army the provost marshal performs the duties of military executioner.

EXEC'UTIVE DEPARTMENT. The branch of government to which is confided the duty of executing the laws; in distinction from the legislative department, which enacts, and the judicial department, which interprets them. In the United States government the chief executive officer is the President; in the several States, the Governor. The secretaries of State, Treasury, Interior, Agriculture, War, the Navy, Commerce, and Labor, with the Postmaster-General and the Attorney-General, are commonly called chiefs of the executive departments. The Constitution does not recognize their existence, but custom has made them the President's advisers.

EXEC'UTIVE OFFICER. On a vessel in the United States navy, the officer of the line (or executive branch) next in rank to the captain. He is commonly appointed to this duty by the Navy Department; but in cases of detachment of the executive officer without another being sent in his place the next senior officer is then detailed by the captain. In battleships and large armored cruisers the executive officer is usually a commander; in smaller vessels, a lieutenant commander or officer of lower grade, depending upon the size of the ship. He is the aid and executive of the captain in all matters pertaining to the ship and is responsible to the latter for the proper organization of the ship's company and for all drills and routine work. He acts as recruiting officer and has entire charge of the enlisted force, including their records, having under his control one or more yeomen (see YEOMAN) as clerks. In large ships the care of the ship and its equipment devolves upon the first lieutenant (see LIEUTENANT, FIRST), but in those of less size this work also is controlled by the executive. He is "on duty" at all times when on board and has general supervision, under direction of the captain, of all matters connected with the organization, police, inspection, discipline, exercise, and efficient condition of the crew, and (if there be no first lieutenant) of the cleanliness, good order, and neat and trim appearance of the ship. When all hands are called for the purpose of carrying on general drills, he has charge of the ship, subject to the direction of the captain. In battle he has general supervision of the battery and of all matters pertaining to the safety of the ship except her navigation.

EXEC'UTOR (Lat., performer, accomplisher). The personal representative of a decedent, appointed by last will and testament. His functions are to-day substantially those of an administrator and are limited to the administration of the personal estate of the testator. By the ecclesiastical law of England, however, by which his powers and duties were formerly regulated, his position was one of much greater consideration. There he was regarded much in the light of the heir (*hæres*) of the Roman law (from which the ecclesiastical law was mainly derived), and as the owner of the personal property left by the decedent. His duty was originally confined to the discharge of the funeral expenses and the debts of his testator and, later, of the personal legacies bequeathed by the will, the residue in his hands belonging to him absolutely. The right, universally recognized to-day, of the next of kin of the decedent to share the residuum of the personal estate among them, after payment of debts and legacies, is wholly due to a series of statutes, which have gradually reduced the executor to the position of an administrator.

As the expression "personal representative" indicates, the executor is entitled only to the personal rights of his testator, and not to those in our law denominated real; i.e., only the personal property and personal rights of action—as on contract, for debts due, etc.—accrue to him, while real property and rights of entry and actions for the recovery of freehold estates in land descend to the heir. Where, as is frequently the case, the executor is authorized by the will to sell real estate for the payment of debts, he does not thereby acquire any title therein, but only a power of appointment of sale. (See POWER.) The proceeds of such sale become equitable assets (q.v.) in his hands.

In this respect his position has always been different from that of the Roman *hæres*, who succeeded to the entire estate of his testator. Like the *hæres*, however, and unlike the English and American administrator, the title of the executor to the personal estate of the decedent vests at once upon the latter's death and is not dependent upon the probate of the will under which he claims, nor the issue of letters testamentary. It is only for the purpose of enabling him to maintain suits at law and as conclusive evidence of his authority that probate proceedings are necessary. It should be added that, while the restriction of the executor's estate and authority to the personal property of his testator is still generally observed, a few American States have by statute invested him with similar jurisdiction over the real estate, and that a similar change has recently been effected in the English law by the Land Transfer Act, 1897 (60 and 61 Vict., c. 65).

The duties of an executor are now usually prescribed by statute and may be briefly summarized as follows: *First.* To bury the decedent in a manner suitable to the estate. *Second.* To prove the will and take out letters testamentary. *Third.* To make and file with the probate court an inventory of the personal estate. *Fourth.* To collect the goods and chattels of the testator, and his claims against others, with reasonable diligence. *Fifth.* To advertise for claims against the estate. *Sixth.* To pay the debts in the order of priority established by law. *Seventh.* To distribute the chattels and pay the legacies in accordance with the terms of the will. *Eighth.* To convert the surplus of personal estate, if any, into cash, and distribute it among the next of kin, according to the statutes of distribution. *Ninth.* To keep the money and other property of the estate safely and prudently. *Tenth.* To render an account whenever called upon by proper authority so to do, and to apply for a discharge upon a final accounting, within the time prescribed by statute for the completion of the administration.

Generally speaking, any one who is not mentally incompetent may be an executor; even infants, and married women under the common-law disability of coverture (q.v.). The court may compel an insolvent or nonresident executor to give security; but ordinarily an executor need not give security, unless (as is the case in some American States) he is required by statute so to do. No one is compelled to accept the office of executor against his will; but, having once been accepted, the duty cannot be renounced nor assigned to another, and the acceptance may be informal and even unintentional, as by taking possession of the estate, paying the executor's own claim out of money of the testator in his hands, etc.

Executor de Son Tort. A person not named in the will as executor may, by usurping the office, have its liabilities and many of its powers imposed upon him, without thereby acquiring its privileges and immunities. Such a person is known as an executor of his own wrong (*de son tort*). Any assumption of authority over the estate, or any interference with it, such as belongs of right to an executor, constitutes such a usurpation. An executor *de son tort* is liable only for such assets as come into his hands, and the acts of *de facto* administration performed by him are in general valid so far as other parties who deal with him in good faith are concerned.

In the law of Scotland the term "executors" is employed to describe the next of kin of a decedent, whether testate or intestate, who are entitled to share in the distribution of his personal estate, the person corresponding to the executor of English and American law being distinguished by the title of testamentary executor. See ADMINISTRATION; DISTRIBUTION; HEIR; PERSONAL REPRESENTATIVE; WILL. Consult: Burn, *Ecclesiastical Law* (30th ed., London, 1869); Williams, *The Law of Executors and Administrators* (9th ed., ib., 1893); Croswell, *The Law Relating to Executors and Administrators* (St. Paul, 1897); Woerner, *The American Law of Administration* (2d ed., Boston, 1899); Schouler, *Treatise on the Law of Executors and Administrators* (4th ed., ib., 1910); Ingpen, *The Law Relating to Executors and Administrators* (2d ed., London, 1913).

EXEC'UTORY DEVISE. A testamentary gift of a future interest in real or personal property of such a nature that it cannot be brought within the technical description of a remainder. In its earlier period the common law recognized no future estates in personal property, nor any in real property but reversions and remainders. Both of these were the remnants of a freehold out of which a smaller estate had been "carved," as the expression was, and given to another. If this remnant was retained by the former freehold tenant, it was a *reversion;* if it was, at the time of the creation of the lesser estate, given to a third person, it was a *remainder.* Thus, if a tenant in fee simple made a conveyance of a life estate, he still had a fee simple which was conceived of as reverting to him at the expiration of the life estate, or which he might vest in another as a remainder. In either case the future estate, to be valid, must fit exactly upon the precedent estate. An interval of even a day between the two rendered the attempted future estate void. Neither could there be a remainder to take effect in the future without a preceding estate "to support it," nor could a remainder be created after or in derogation of a fee simple.

The practice of conveying lands to the use of, or in trust for, others, which prevailed in England during the fifteenth and sixteenth centuries, opened the way for the recognition of certain future interests in land which were not permitted by the rigid and artificial common-law system, and the famous Statute of Uses, passed in the twenty-seventh year of Henry VIII (1535), stereotyped these interests into new legal estates, known as *springing* and *shifting uses.* The Statute of Wills (32 Hen. VIII), which for the first time permitted the free alienation of lands by will, enabled testators to create the same interests more simply and directly by testament, under the description of executory devises. These were of two classes, corresponding to the shifting and springing uses, the former including future estates to take effect in substitution for a preceding fee simple—as a gift of land to A and his heirs, the same to go to a charity if A or his heirs ever ceased to occupy the premises so given; the second comprehending future interests to arise on a future event—as a devise to B when he should attain the age of 21 years. In the form here described, executory devises have continued to be a recognized form of testamentary disposition of real estate, and the expression has also been extended by analogy to include certain future interests in personal property which have acquired legal recognition.

This form of limitation is restrained by the law against perpetuities (q.v.), which requires that the estate must take effect within a life or lives in being and 21 years after. The law will not interpret a limitation as an executory devise if it can be otherwise sustained. Whenever, therefore, a future interest in land is so devised as to fall within the rules laid down for the limitation of contingent remainders, such devise will be construed as a contingent remainder and not as an executory devise. An executory devise, unlike a remainder, could not be defeated by any act of the first taker or devisee; when, therefore, an absolute power of disposition is in the first taker, the limitation over is not an executory devise. See DEVISE; FUTURE ESTATE; REMAINDER; USE AND OCCUPATION.

EX'EDRA (*ἐξέδρα*, from *ἐξ*, out + *ἕδρα*, a seat). Among the Greeks and the Romans a seat built out from a portico or colonnade, usually semicircular, and sometimes roofed over with a hemispherical vault. They were used as pleasant places for conversation. They were sometimes out of doors, as in the Street of the Tombs at Pompeii, sometimes parts of buildings, as of the great thermæ at Rome. Exedræ have been built also in modern times, notably in the famous Sieges-Allée in Berlin.

EX'EGE'SIS (Neo-Lat., from Gk. *ἐξήγησις*, *exēgēsis*, explanation, from *ἐξηγεῖσθαι*, *exēgeisthai*, to explain, from *ἐξ*, *ex*, out + *ἡγεῖσθαι*, *hēgeisthai*, to lead, from *ἄγειν*, *agein*, to lead) OF THE BIBLE.

OF THE OLD TESTAMENT

The Bible of the apostolic church was, naturally, the Scriptures of the Jews, and these Scriptures mainly in the Greek translation, since the popular ignorance of the Hebrew language among the first Hellenistic and Gentile converts to Christianity rendered direct use of the original text impossible, acquaintance with this text being largely limited to the Jewish Christians of Palestine. Concerning the interpretation of these Scriptures by the immediate disciples of Jesus, we have no certain information. It may be inferred, however, from such documents as we possess, that their exegesis of the law did not differ materially from that of the earlier rabbis in the Mishna, while their haggadic interpretation of the prophets and the Psalms was such as to furnish them with proofs of the Messiahship of Jesus and with material for His life. This attitude was preserved, even beyond the middle of the second century, in the Ebionitish circles, whence some of the Clementine writings proceeded. But the identity of Judaism and Christianity could be maintained only at the sacrifice of certain parts of the law that were declared unprophetical, and therefore un-Mosaic. In this connection observations of style are introduced in which the beginnings of literary criticism may be discerned. A fresh impulse in the direction of an allegorizing exegesis was given by Gnosticism. When men like Valentinus and his disciples, Ptolemy and Heracleon, Basilides and Isidore, Saturninus and Carpocrates, Marcion and Tatian, embraced Christianity, it was impossible for them to be satisfied with even the most liberal attitude of the Christian Jew. No synagogue training prevented them from measuring "the God of the Jews" by the standard furnished by the Christian revelation, and the commandments of the Law by standards of Christian worship and morals. An effective defense of the Catholic side could only be made by the chastened Gnosticism and allegorizing interpretation that meet us in Hebrews, Barnabas, Colossians, Ephesians, the Pastorals, and the Fourth Gospel. The same method and speculation were characteristic of Justin (died c.166), Pantænus (died c.190), Clement of Alexandria (died c.215), and Origen (died c.254). As a textual critic and as a thinker, Origen easily holds the foremost place among the early fathers, though his knowledge of Hebrew was inferior to that of Jerome. His allegorical method was followed by Dionysius (died 265) and Gregory Thaumaturgus (died c.270); and, to a large extent, by Eusebius (died c.340), Athanasius (died 373), the three Cappadocians, Basil (died 379), Gregory of Nyssa (died c.395), and Gregory of Nazianzus (died c.390); Ambrose of Milan (died 397), and Cyril of Alexandria (died 444). On the other hand, the foundations of a sound historico-grammatical interpretation were laid by the school of Antioch, whose chief representatives were Theodore of Heraclea (died 350), Eusebius of Emesa (died c.360), Diodorus of Tarsus (died 394), Chrysostom (died 407), Theodore of Mopsuestia (died 429), his brother Polychronius, and Theodoret of Cyrus (died c.457). Especially the criticism of Theodore of Mopsuestia was often very keen. Ephraem Syrus (died 378) also devoted himself particularly to a grammatical explanation of the text, and the school of Nisibis seems to have been comparatively free from allegorizing tendencies, as may be seen from the conception of the Bible which Junilius (died 552) declares that he has received from Paul the Persian. Through Jerome (died c.420) and Augustine (died 430), however, the interpretation that sought to discover a double or manifold sense became dominant in the Latin church. Jerome possessed a deeper knowledge of Hebrew, acquired from Jewish teachers in Palestine, than any other patristic writer, and had great skill as a translator; while Augustine knew no Hebrew and little Greek, but often understood the meaning of the text better. Though he had neither the erudition of Jerome nor the genius of Augustine, Faustus of Mileve (born 344) was a greater critic than either, anticipating some important positions of modern scholarship.

In the sixth century commentators like Cassiodorus (died c.580) and Procopius of Gaza (died 520) began to give a conspectus of earlier interpretations in so-called "chains" (*catenæ*, *σειραί*), and Cosmas Indicopleustes (c.550) gave a summary of authorship, purpose, and contents of the biblical books. The learned Isidore of Seville (died 636), Bede (672–735), and Alcuin (died 804) largely epitomized Jerome. These excerpts from the fathers were much reduced in the *Glossa Ordinaria* of Walafrid Strabo (died 849), and by the learned Rabanus Maurus (died 856), who already seems to have given some attention to the Hebrew; also by Haymo of Halberstadt (died 853) and Remigius of Auxerre (died 890). With Johannes Scotus Erigena (died c.891) the allegorical interpretation covered many views in advance of his age, on the creation, the fall of man, the last things, and other subjects. Lanfranc (c.1005–89) continued Alcuin's labors for the purification of the Latin text. Anselm of Laon (died 1117), in his *Glossa Interlinearia*, Rupert of Deutz (died 1135), and Hugo of St. Victor (died 1171) pursued the fourfold sense of Scripture—historical, allegorical, tropological, and anagogic; and even men like Thomas Aquinas (died 1274), Bonaventura (died 1274), and Albertus Magnus (died 1280) did not break with the prevailing method. But the teaching of Abélard (died 1142) and the Nominalists had a tendency to call the attention away from types and allegories, and Roger Bacon (died 1294) applied his method, not only in the study of natural objects, but also as a textual critic. In order to convert the Jews and Moslems, to dispute successfully with them, or even to expurgate their books, it became necessary to learn the Hebrew and Arabic languages. Seminaries where Hebrew and Arabic were taught began to be founded in the thirteenth century, and the Council of Vienne (1311) ordained that chairs of Hebrew, Arabic, and Aramaic should be established in Paris, Bologna, Oxford, and Salamanca. The results of this new impulse are seen in the *Pugio Fidei* of Raymond Martini (died 1296) and the *Postilla* of Nicolas of Lyra (died 1340). Both of these authors were familiar with Talmudic and Rabbinic writings, as well as with the Hebrew Bible, and especially the latter drew largely upon Solomon ben Isaac (Rashi).

The Renaissance brought an improved critical method, as well as increased knowledge of classical antiquity. Of great importance was the criticism of sacred texts and traditions by Lorenzo Valla (died 1457). Such Hebraists as Johann Wessel (died 1489), Pico della Mirandola (died 1494), Conrad Pellicanus (Kürschner, died 1556; his grammar appeared 1503), and Johann Reuchlin (died 1522) facilitated the philological study of the Bible. The exegesis of Franz Vatablus (Vatblé, died 1547), Santes Pagninus (died 1541), Johannes Maldonatus (died 1583), and Gilbert Génébrard (died 1597) was based on the Hebrew text as well as on the Latin and Greek versions and sought to discover the literal sense. Even Titelmann (died 1530) and Cajetan (died 1534), who knew the original only through Latin translations, recognized its importance and discarded allegorizing. The learned lawyer Andreas Masius (Maes) in 1574 published an important commentary on Joshua, in which he maintained that the Pentateuch had been compiled by Ezra from documents of different ages. Great services were rendered to textual criticism by Ximenes through his editions of the Bible in the Complutensian polyglot (1514–17); Arias Montanus, as editor of the Antwerp polyglot (1569–72); Pierre Morin and Antonio Caraffa, by editing the Sixtine edition of the Greek Bible (1587); and Robert Stephanus (Estienne) in preparing for the press the Latin Vulgate (1532).

Martin Luther (died 1546) broke in principle with the allegorical method, though his exegesis still shows its lingering fascination and is at times unduly influenced by dogmatic considerations. While he recognized the importance of the Greek and Latin versions, he leaned somewhat too confidently on the Masoretic text as the "veritas Hebraica." He opposed the authority of the Bible to that of the Church, yet in determining the canonicity and relative value of the books he depended largely upon his own subjective judgment. His German version is an admirable achievement and exercised a great influence on the interpretation of the Bible among Protestants. Philip Melanchthon (died 1560) and Johannes Brentius (Brenz, died 1570) possessed a good equipment for exegetical work. Ulrich Zwingli (died 1531) and Johannes Œcolampadius (Hausschein, died 1531) were also sober and capable exegetes. But easily the foremost interpreter of the Bible in the sixteenth century was John Calvin (died 1564). His knowledge of Hebrew may have been less than Luther's, but his exegesis is freer from irrelevant digressions, observes more keenly the connection of thought, and attempts to explain what needs explanation. Philologically the commentaries of Johannes Mercerus (Mercier, died 1570) are of great value. Less important are those of Theodore Beza (died 1605). Among the more radical interpreters of the time Andreas Bodenstein Carlstadt (died 1541), Johannes Denck (died 1529), Sebastian Castalio (Chateillon. died 1563), and Michael Servetus (died 1553) deserve to be mentioned. Carlstadt wrote discriminatingly on the canon, and his remarkably keen literary criticism led him to reject the Mosaic authorship of parts of the Pentateuch. Denck interpreted the Bible as an expression of the spirit that enlightens every man and, instead of Church or Bible, made the Christian consciousness the ultimate judge of truth. His translation of the prophets was valued and used both by Luther and in the Zurich Bible. Chateillon recognized the true character of Canticles and urged its exclusion from the canon. In editing Santes Pagninus' Latin translation Servetus expressed in notes some very advanced ideas.

During the seventeenth century marked contributions to biblical interpretation were made by Catholic scholars, especially by members of the Society of Jesus and the Oratorians. Among the former, Bento Pereira, in 1600, and Jacques Bonfrère, in 1625, called attention to post-Mosaic material in the Pentateuch. Athanasius Kircher (died 1680) laid the foundations of our knowledge of Coptic and began to use it for the elucidation of the Bible. Cornelius à Lapide (van den Steen, died 1637) prepared a learned commentary on the whole Bible. Two fathers of the Oratory, Jean Morin (died 1659) and Richard Simon (1638–1712), rendered distinguished services to biblical science—the former chiefly by his Samaritan studies and his recognition of the late date of the vowel points, the latter by his excellent critical history of the Old Testament (1678), in which he set forth the evidences against the Mosaic authorship of the Pentateuch. Of importance was also the publication by Michael le Jay of the Paris polyglot in 1629–45. The comments of Catholic interpreters such as Emmanuel de Sa (died 1596), Wilhelm Estius (died 1613), and Tirin (died 1636), were gathered together by Jean de la Haye in his *Biblia Magna* (1643) and *Biblia Maxima* (1660). Among the Protestants, Johannes Drusius (van den Driesche, died 1616); Johannes Piscator (Fischer, died 1626); Joseph Scaliger (died 1609), who first brought Israel's history into connection with the history of Semitic antiquity; Hugo Grotius (de Groot, died 1645), whose sober exegesis eliminated a mass of supposed Messianic prophecies; Louis de Dieu (died 1642); Johann Heinrich Hottinger (died 1667); Samuel Bochart (died 1669); Sebastian Schmidt (died 1696); and August Pfeiffer (died 1698)—by their works contributed to the understanding of the Bible. The most learned Hebraists of the time were Johann Buxtorf (died 1629) and his son, Johann Buxtorf (died 1664). Their contention for the high age of the vowel points influenced deeply theological thought. It is the chief merit of Louis Cappel (died 1658) that he upheld the truth, now universally recognized, against their error. In England, Bryan Walton (died 1661), the editor of the London polyglot; the eminent Orientalists Edmund Castle (died 1685) and Edward Pocock (died 1691); John Pearson (died 1686), one of the editors of the great compilation *Critici Sacri* (1660); Matthew Poole (died 1679), editor of the *Synopsis Criticorum* (1669–76); John Selden (died 1654); John Lightfoot (died 1675), the student of rabbinic lore; John Spencer (died 1693), who first viewed Hebrew ritual in the light of the customs of other nations; Thomas Hobbes (died 1679), whose *Leviathan* (1651) paved the way for a more fruitful literary criticism; and Charles Blount (died 1693), who showed the disparity between the account of creation in Genesis and the facts discovered by science—all rendered service in biblical interpretation.

Possibly the most important contributions of Catholic scholars in the eighteenth century were made by Charles François Houbigant (died 1783), whose Latin translation was made for the first time throughout from a Hebrew text, amended by conjectural criticism (1753); Jean Astruc (died 1766), who in the same year published his epoch-making conjectures as to the documents used by Moses in the composition of

Genesis; Augustine Calmet (died 1757), who published the first Bible dictionary; and Alexander Geddes (died 1802), who first embodied in a commentary (1792–97) the results of Pentateuchal documentary analysis. The intense study of natural science in England caused the critical inquiries of the Deists. After Herbert of Cherbury and Charles Blount it was especially Anthony Collins (died 1729), the first in modern times to recognize that Daniel was written in the Maccabæan age, though it had long been perceived that the events of this time were referred to, and John Toland (died 1722), whose labors advanced biblical science. On the other hand, the Quaker movement developed a conception of religious liberty and a reliance upon subjective judgment from which biblical interpretation ultimately derived great benefit. For the appreciation of Hebrew poetry Robert Lowth's treatise upon the subject in 1753 was of utmost importance. The Bible edition of Benjamin Kennicott (1776–80), together with its necessary supplement, G. B. de Rossi's *Variæ Lectiones* (1784–88), made it evident that all extant manuscripts represent substantially the same text recension, though it was reserved for scholars in recent times to see the value of the numerous variants they presented. The still indispensable edition of the Greek Bible by Holmes and Parsons (1798–1827) was also begun in this century. J. Clericus (le Clerc, died 1736) made the Continent acquainted with the work of the English Deists and enriched science with excellent commentaries. Hadrian Reland (died 1718) and Albert Schultens (died 1751) elucidated the text by their historical and philological investigations. Campegius Vitringa (died 1722) wrote a learned exposition of Isaiah, and J. G. Carpzov (died 1767) an excellent introduction to the Old Testament. Akin to the Deists, but more learned, was Hermann Samuel Reimarus (died 1768), whose *Wolfenbüttler Fragmente*, published by Lessing in 1774, searchingly examined the Pentateuch. Voltaire (died 1778) drew from English thinkers many of the arguments with which he undermined traditional beliefs concerning the Bible. Meanwhile the Quaker leaven was spreading. Pietistic exegesis was at first allegorizing, but gradually became infected with rationalism. The transition may be seen in Zinzendorf (died 1760), Edelmann (died 1767), C. F. Bahrdt (died 1792), and J. D. Michaelis (died 1791); but especially in Johann Salomo Semler (died 1791), whose discussion of the canon proved of great value, and Heinrich Corrodi (died 1793), whose studies of the chiliastic movements prepared him to understand the Book of Daniel. J. G. Herder (died 1803) contributed greatly to an understanding of Canticles and other poetic parts of the Bible. Influenced by the philosophy of Christian Wolff (died 1754), and that of Immanuel Kant (died 1804), a rationalistic school of biblical interpretation was formed, among whose chief representatives H. E. G. Paulus (died 1851), by his studies of prophecy and of the Book of Joshua; Karl David Ilgen, by his remarkable work on the documents in the temple archives at Jerusalem (1798); and Paulus's disciple, Johann Gottfried Eichhorn, by his masterly introduction (1780–83), particularly furthered biblical exegesis.

The nineteenth century witnessed a marked progress in the interpretation of the Hebrew Bible. Among the Catholic exegetes Johann Jahn (died 1816), J. G. Herbst (died 1836), Franz Kaulen, and J. Cornely, by their introductions; Anton Scholtz, by his bold and thorough textual criticism; and Gustav Bickell, by his meritorious studies of Hebrew poetry, deserve special mention, though many others made substantial contributions. But the leadership in biblical exegesis was maintained by Lutheran theologians in Germany. It was largely, if not wholly, due to their influence that competent and independent interpreters appeared in other European countries and in America in the latter part of the century. Hegel, Schleiermacher, and De Wette made a deep impression upon theological thought, and their disciples reached with a bound many critical positions to which a later generation has been forced back after a significant and valuable reaction. W. M. L. de Wette (died 1849) recognized the mythical and legendary element in the Pentateuchal narratives, placed the date of the Deuteronomic law in the reign of Josiah, and discussed the character of the Chronicler's historiography. He became the chief representative of the fragmentary hypothesis of Geddes, introduced into Germany by Johann Severin Vater in 1802, though the possibility of a more extended document supplemented by later hands, which was presented by Stähelin, Bleek, and Ewald, subsequently attracted him. His pupils, C. P. W. Gramberg in 1829, Wilhelm Vatke and J. F. L. George in 1835, under the influence of Hegel's philosophy of history, traced the growth of customs and ideas, anticipating some important conclusions reached by later exegetes under the influence of the philosophy of evolution. Bruno Bauer in 1838 discussed the true character of the Book of Job and advocated its postexilic origin. The ripest exegetical fruit of the rationalistic school was the commentary on Isaiah published in 1821 by Eichhorn's pupil, Wilhelm Gesenius (died 1842). That some of the critical positions were temporarily lost was not so much due to the vain attempts of Hengstenberg (died 1869), Hävernick (died 1845), and Keil (died 1894) to rehabilitate traditional views, as to the natural suspicion of a construction of Israel's history based on philosophical assumptions and to a truer appreciation of the potency of personality as against impersonal force. Quite the most influential Old Testament exegete of the middle of the century was Heinrich Ewald (died 1875). His learning, insight, and independence admirably fitted him to interpret the prophets and poets of Israel, but his sense of the historic development was not so keen. His most eminent disciple, August Dillmann (died 1894), in his learned and critical commentaries, maintained some of Ewald's conservatism. Justus Olshausen, in his commentary on the Psalms (1853), first perceived clearly the essentially Maccabæan background. Hermann Hupfeld (died 1866) in the same year brought Pentateuchal criticism back to the documentary hypothesis by his characterization of the sources of Genesis, and later wrote an excellent commentary on the Psalms. The critical investigation of Jeremiah, begun by F. C. Movers in 1837, was carried on by Ferdinand Hitzig (died 1875), who also elucidated the Psalms and the minor prophets by his keen textual and literary criticism. The commentaries of August Knobel (died 1863) were marked by great erudition. In 1866 Karl Heinrich Graf maintained that the laws of the so-called priestly code were postexilic; and the character of this literary stratum was searchingly examined by the distinguished

Semitic scholar Theodor Nöldeke in 1869. Of great importance was the series of contributions by Julius Wellhausen to Pentateuchal criticism, begun in 1876, to which he added a careful study of the text of Samuel (1871) and suggestive notes on the minor prophets (1892). The brilliancy of his style, the cogency of his reasoning, and the harmony of his conception of history with the doctrine of evolution have given a wide currency to his views. In 1881 the *Zeitschrift für alttestamentliche Wissenschaft* was founded by Bernhard Stade (died 1906). In it much valuable work has appeared—none more important than that of the editor himself, whose critical acumen not less than his historical insight was also seen in his history of Israel (1888). Another admirable historian, Eduard Meyer, also enriched biblical criticism by many a contribution, notably by his studies of Ezra and Nehemiah (1896). Adalbert Merx, in an exceedingly learned and valuable commentary on Joel in 1879, paved the way for an understanding of that book. Karl Budde, by his *Biblische Urgeschichte* in 1883 and his studies on Judges and Samuel, as well as by his important discovery of the Kina metre, has done good service to biblical exegesis. Karl Siegfried by his painstaking studies in Hellenistic philosophy was admirably prepared for his thorough investigation of Ecclesiastes (1893). An exegete of marked originality and great ability is Bernhard Duhm, whose commentaries on Isaiah in 1892, on the Psalms in 1899, and on Jeremiah in 1901 have proved very helpful. Sympathetic insight and critical independence also mark the commentary on Genesis by Hermann Gunkel (1901; 3d ed., 1912). What is best in *Bunsen's Bibelwerk* comes from Adolf Kamphausen's hand. The contributions by Franz Delitzsch (died 1890) to the Keil-Delitzsch commentaries are particularly valuable for the author's profound knowledge of rabbinic lore. August Klostermann's commentary on Samuel and Kings (1887) exhibits a textual criticism as startlingly bold as the exegesis is conservative. Rudolf Smend's commentary on Ezekiel (1880) is particularly important. The series of commentaries edited by Michael Wilhelm Nowack contains many good expositions, and that edited by Karl Marti contains, among others, good commentaries by the editor himself on Isaiah (1900), the minor prophets (1904), and Daniel (1896). Karl Heinrich Cornill, in his study of the text of Ezekiel (1886), showed himself an excellent textual critic. No contributions to textual criticism during the nineteenth century were more significant than those of Paul de Lagarde (died 1891), whose marvelous native resources, philological and philosophical, were mainly devoted to the Greek version. In the twentieth century the studies of the Greek text have been effectively carried on by A. Rahlfs; and R. Kittel, with several coadjutors, has furnished a convenient edition of the Hebrew Bible, with a useful, though necessarily limited, textual apparatus (last ed., 1912). Luther-Meyer's *Die Israeliten* (Halle, 1906), Kittel's *Geschichte Israels* (2d ed., Gotha, 1912), Hugo Gressmann's *Mose und seine Zeit* (1912), and the translations with introductions and comments edited by Emil Kautzsch, Karl Marti, and Hermann L. Strack, have furthered exegesis.

In Holland Abraham Kuenen (died 1891), H. Oort, W. H. Kosters (died 1897), J. C. Matthes, and G. Wildeboer have rendered especially valuable services to biblical interpretation. Kuenen, a most conscientious and painstaking scholar, was the first to maintain that the priestly sections, narrative as well as legislative, were post-exilic. Kosters first searchingly inquired into the historical character of the story of the return from Babylon. In the present century B. D. Eerdmans, by a searching criticism, has shown the necessity for a new consideration of the Pentateuchal problem. He is editor of the influential *Theologisch Tijdschrift*. In France Eduard Reuss (died 1891) as early as 1833 expressed his conviction that Leviticus was post-exilic, and by his excellent translation of the entire Bible with commentary spread the results of a more fruitful Bible study among his countrymen. Ernest Renan (died 1892) commented with particular success on Ecclesiastes. The important epigraphical labors of eminent French scholars, particularly Clermont-Ganneau, have also been of considerable value to interpretation. The *Revue Biblique Internationale* has become the leading French journal devoted to biblical exegesis and archæology; its editor, the learned Dominican Joseph Lagrange, by his commentary on Judges (Paris, 1903) and other works, and Hugue Vincent by his archæological studies have greatly furthered biblical science. In Great Britain Samuel Davidson, in editing the tenth edition of Horne's introduction (1856), introduced a more scientific view of the Hebrew Bible. More important, however, was the acute criticism of the Pentateuch and Joshua by J. W. Colenso (1862–79). Rowland Williams contributed to the understanding of the prophets (1866). By his thorough knowledge of Arabian antiquity W. Robertson Smith (died 1894) was able to throw much light upon the biblical writings. A. B. Davidson (died 1902) was a thoughtful and independent expositor. Samuel R. Driver (died 1914), by his introduction, his commentaries, and his contributions to Hastings's *Dictionary of the Bible* (New York, 1904), of which he was one of the editors, won well-deserved confidence as an interpreter of the Bible. Thomas K. Cheyne is an acute textual critic and a resourceful and sympathetic expounder of the thought. His earlier works upon Isaiah and the Psalter and in the *Encyclopædia Biblica* (4 vols., New York, 1899–1903) have distinctly advanced biblical science. German methods of interpretation became known in America through an essay on Messianic prophecy by George R. Noyes, in 1834, John G. Palfrey's lectures on Jewish history (1840), and Theodore Parker's translation of De Wette's introduction (1840). Since 1881 the Society for Biblical Literature and Exegesis has published a *Journal of Biblical Literature* (Boston, 1882–) distinctly devoted to the interpretation of the Bible, and many valuable contributions have been made in its pages by American scholars. Most of the contributors to the *International Critical Commentary* (New York 1895–) are Americans. The volumes of this work that have thus far appeared are: *Genesis* by John Skinner, *Numbers* by G. B. Gray, *Deuteronomy* by S. R. Driver, *Judges* by George F. Moore, *Samuel* by Henry P. Smith, *Chronicles* by A. B. Curtis, *Ezra and Nehemiah* by L. W. Batten, *Psalms* by G. A. Briggs, *Proverbs* by C. F. Toy, *Ecclesiastes* by G. A. Barton, *Isaiah* by G. B. Gray, *Amos and Hosea* by W. R. Harper, *Haggai, Zechariah, Malachi, and Jonah* by Mitchell, Smith, and Bewer, *Micah, Zephaniah, Nahum, Habakkuk,* *Obadiah, and Joel* by Smith, Ward, and Bewer, and *Esther* by L. B. Paton. The *Messages of the Bible* (New York, 1899–1911) contains commentaries on the *Historians and Psalmists* by John E. McFayden, the *Lawgivers* by Charles F. Kent, the *Prophets* by Frank K. Sanders and Kent, *Daniel* by F. C. Porter, *Job, Canticles, and the Minor Poems* by N. Schmidt; and the *Bible for Home and School* (New York, 1908–13) contains commentaries on *Genesis* by E. G. Mitchell, *Job* by Barton, *Judges* by Curtis, *Deuteronomy* by Jordan, and *Isaiah* by McFayden. Of the *Polychrome Bible*, edited by Paul Haupt, presenting, in different colors to indicate the different literary strata, a critically restored text and the translation into modern English of this text, a large number of volumes has appeared, though the work is not yet quite complete. Among recent commentaries written by English scholars the *Pulpit Commentary* (London, 1880–) and the *Expositor's Bible* (New York, 1901–), but especially the *Cambridge Bible for Schools and Colleges* (Cambridge, 1905–), and the *Century Bible* (New York, 1901–13), should be mentioned, and among recent exegetes particularly W. H. Bennett, H. A. A. Kennedy, S. A. Peake, and R. H. Charles.

On the books not found in the Hebrew Bible, but extant in the Greek Bible and included in the canon of the Roman Catholic church, much valuable work has been done by C. F. Fritzsche, the contributors to Kautzsch's *Apokryphen*, T. André, John Howorth, C. C. Torrey, and the contributors to Charles's *Apocrypha* (see DEUTEROCANONICAL BOOKS); and on the books regarded by other early churches as belonging to the Old Testament, especially by Friedrich Lücke, Adolf Hilgenfeld, August Dillmann, Emil Schürer, R. H. Charles, the contributors to Kautzsch's *Pseudepigraphen* (Tübingen, 1902) and to Charles's *Pseudepigrapha* (Oxford, 1913), and Székely's *Bibliotheca Apocrypha* (Freiburg, 1913).

OF THE NEW TESTAMENT

To the Jewish Scriptures were gradually added by the post-Apostolic Church the distinctive writings of the Apostolic age, as of the same authoritative inspiration as the older writings, and, consequently, open equally with them to the study of the Church. The first of these Christian writings to be studied were those which contained the life and teachings of Jesus, the earliest-known example of such study perhaps being the reputed work of Papias (c. 140), entitled *An Exegesis of the Sayings of Our Lord*, and based upon at least the Gospels of Matthew and Mark. Other efforts at Gospel exposition appear in the *Exegetica* of the Gnostic Basilides (died c.140), the *Hypomnemata* of the Valentinian Heracleon (c.150), and in the commentary on the Gospels held by some critics to have been written by Marcion (c.150). These works are preserved only in fragments, and from the little known of them they seem to have been written not only in a dogmatic spirit, which was doubtless due to the heretical position that most of the writers maintained toward the Church, but also after the allegorical method, which was the controlling principle of all interpretation in that age.

Evidence of this tendency to study the Gospels is further furnished by such works as Tatian's *Diatessaron* (c.170), an attempt to weave out of the four Gospels a single story of the life and teaching of Christ, on which composite Gospel Ephraem Syrus wrote a commentary; and by Marcion's reconstruction of the Gospel of Luke as the sole basis for the Gospel narrative. In fact, the numerous apocryphal Gospels are themselves witness to the primary interest which the second century took in the Gospel traditions.

No genuine exegesis of the New Testament writings, however, was produced until the rise of the Alexandrian school in the latter part of the second century, the most illustrative representative of which was Origen (c.185–254). His exegetical writings may be separated into three groups, which differ among themselves largely in the object they have in view. The first group (*Scholia*, Notes) consisted of brief exegetical remarks intended mainly for the elucidation of difficult passages; the second group (*Homiliai*, Homilies) consisted of expository discourses delivered in connection with public worship, and having as their purpose the instruction and edification of the general congregation; the third group (*Tomoi*, Volumes) consisted of elaborate treatments of entire books of Scripture, with a view to making them intelligible to the more educated class. Of these groups only the last dealt in any comprehensive way with the New Testament. But in this group all the Gospels were treated, with the exception of Mark, and all the Epistles, excepting 1 and 2 Corinthians and 1 and 2 Timothy. No commentary is known on Acts, and it is uncertain whether he wrote on the Catholic Epistles and the Apocrypha. The spirit of this school's exegesis was, like that of the previous writers, dominantly dogmatic, while its method carried the use of allegory to a further extreme.

More historical in both spirit and method was the North African school, represented by such men as Tertullian (c.200) and Cyprian (died 258), though it has left us nothing in the way of specific expository or commentarial work.

Antagonistic to the Alexandrian school stood the Syrian schools of Edessa and Antioch. The former of these had as its leader Ephraem Syrus (died 378), who produced both homilies and commentaries, the latter extending over the whole Bible, the portion on the Epistles of Paul being preserved in an Armenian translation. The leader of the latter school was Theodore of Mopsuestia (350–429), a scholar of commanding influence in his day, whose exegetical labors were extensive, though of his New Testament work only a Latin translation of his commentaries on Philippians, Colossians, and the Thessalonians, together with numerous Greek fragments from his treatment of other portions of the canon, have been preserved. The method of these schools, in distinction from the allegorical method of the Alexandrian school, was characteristically historical, having as its aim the discovery of the literal sense of Scripture; at the same time their conception of the doctrinal purpose of Scripture study compelled them frequently to resort to the hidden sense of the passage when the literal sense did not suffice. The exegetical influence of these schools, especially of the Antiochian, was far-reaching among the scholars of that day. The most illustrious example perhaps is found in Chrysostom (died 407), who, though developing his work most conspicuously in the form of the Origen homily, in which he covered almost the entire New Testament, wrought it out under the historical principles laid down by Theodore. Under this same influence, to a larger or less extent, stood also Athanasius (died 373), Basil (died 379), Gregory of Nazianzus (died c.390), Ambrose (died 397), Gregory of Nyssa (died c.395), Isidore of Pelusium (died 431), and Theodoret (died c.457). Unfortunately, however, this influence, while to some extent it made itself felt with all scholars of the fifth century, did not remain dominant with them. Theodore's doctrinal opposition to Origen raised against him the cry of heresy that finally brought him and his exegesis into disfavor, allowing Origen's allegorical principles to secure for themselves again a position of power, from which they were not dislodged until the Renaissance brought a new learning to the aid of a scientific method. This reviving influence of Origen is seen as early as Jerome (died c.420), whose exegetical labors, comprehending most of the New Testament, as well as of the Old, disclose a significant return to allegorizing; while it appears later in Augustine (died 430), who elaborated the threefold sense of Scripture suggested by Origen into a fourfold sense; and in Cyril of Alexandria (died 444), who became one of the most pronounced opponents of the Antiochian school.

The complete control of the allegorical exegesis, however, is seen in the mediæval period, which extended from the seventh to the fourteenth century. Its chief contributions were either excerpts from the exegetical writings of the fathers, or glosses upon them, the dominant purpose in all of which work was the support of the doctrines of the Church, and their method mainly the elucidation of the hidden, allegorical sense. In the Eastern church Origen, Chrysostom, and Cyril of Alexandria formed the favorite sources for these compilations, while the chief compilers in the New Testament field were Nicetas of Heracleon (eleventh century) and Macarios Chrysocephalos (fourteenth century). To these should be added Œcumenius (died 990), Enthymius Zigabenus (died 1118), and Theophylact (died 1107), whose commentaries, while possessing considerable original material, were, after all, compilative in character. In the Western church, where the material was drawn mostly from Ambrose, Hilary, Augustine, and Jerome, this reproductive method was most extensively followed, its more prominent examples in the New Testament field being Cassiodorus (died c.580), Bede (died 735), Alcuin (died 804), Rabanus Maurus (died 856), Peter Lombard (died c.1160), and Aquinas (died 1274); to whose more or less excerptive works should be added the distinctive glossaries of Strabo (died 849), Anselm of Laon (died 1117), Hugo of St. Caro (died 1263), and Nicolas of Lyra (died 1340). With the last-named writer, however, began the dawn of a better exegesis. He had a knowledge of both Hebrew and Greek, which enabled him to guard against the allegorical absurdities that had been perpetrated upon the Church by ignorant men. While, therefore, he retained Augustine's conception of a fourfold sense in Scripture, he gave such preference to the literal sense as to make his glossary the most important contribution to exegetical study before the Reformation. With Nicolas of Lyra should be placed Lorenzo Valla (1406–57), whose independent spirit and liberal views made his *Annotations on the New Testament* a classic in the early Reformation times.

The exegesis of this early Reformation period was characterized by the revival of learning which marked the age. This is clearly seen in the exegetical work of Erasmus (c.1466–1536), the most conspicuous figure in this age. His publication of Valla's *Annotations* (1505), his edition of the New Testament in Greek, with comments on his emendations of the Vulgate text and explanations of different Scripture passages (1516), and even his more elaborate paraphrases of the Gospels and Epistles (1517–24), all of which had profound influence upon the growing thought of the period, were conceived more in appreciation of the scholastic value of the original language of Scripture for doctrinal truth than in appreciation of the doctrine itself. Under similar influence of humanism, but with more of the Reformation attitude towards the doctrinal truth, stood Faber Stapulensis (c.1450–1536), who produced a new Latin translation of the Pauline Epistles, accompanied by a commentary (1512), a commentary on the Gospels (1522), and also on the Catholic Epistles (1525), and the first French version of the entire Scriptures—the New Testament being issued in 1523, five years before the Old—a version which formed the basis of the translation of Olivetan (1535); and also Justus Jonas (1493–1555), the first of whose commentaries (Corinthians, 1520) represented the humanism of Erasmus, but whose later work (Acts, 1524) was written in the evangelical spirit of the Reformation.

With the Reformation came a new era of exegesis. The scholarship of humanism continued, but with it was united a new view, which regarded the Bible as the sole and infallible rule of faith by personal interpretation. It was this personal element which formed the soul of the Protestant movement. The revival of learning had made the Scriptures an object of extraordinary study, but to the reformer these Scriptures were not merely a book for learning; they stood in a supreme way as a living revelation from God, the centre and circumference of which was Jesus Christ. Upon Him naturally, therefore, all exegesis was focused, and from Him it gathered a personal relation towards all the Scriptures which it could not otherwise have had. This combination of the scholarly and the personal produced a class of commentaries and expositions which, while burdened with the great dogmatic controversies of the times, were singularly direct in method and personal in application. This is seen most markedly in Luther (1483–1546) and Zwingli (1484–1531), the former of whom in his comprehensive commentary on Galatians, and the latter in his fragmentary expositions of Matthew and Acts and some of the Epistles, made the basis of their work the literal sense of Scripture and its value for the individual religious life. These characteristics are evident also in Melanchthon's (1497–1560) Expositions (Romans, 1522; John, 1523; Colossians, 1527; Gospels generally, 1544), the feature in which is not so much the classical learning of this remarkable scholar, who for two centuries exerted such a commanding influence on German education, as the rational method used and the ethical emphasis given to the truth. And even in the great commentaries (covering all the New Testament excepting the Apocalypse) of

Calvin (1509–64), who was preëminently the theologian of the Reformation, this scientific method and this practical element are persistently in evidence. Yet with all the commentators and expositors of this period, the very emphasizing of the religious purpose of their work, and the centring of the idea with which they worked upon Christ, made inevitable more or less of a return to the old fault of allegorizing; though as between Lutheran and Reformed scholars it was the former who fell more frequently into this error, and the latter who developed more consistently the grammatico-historical principles of interpretation with which humanism had endowed the Reformation. These different tendencies are seen, on the one side, in the New Testament work produced by the following Lutheran exegetes: Strigel (died 1569), Brenz (died 1570), Camerarius (died 1574), Flacius Illyricus (died 1575), Chemnitz (died 1586), Cruciger (died 1597), and Chytræus (died 1600); and, on the other side, in the New Testament work of the following Reformed expositors: Pellicanus (died 1556), Meusel (died 1563), Bullinger (died 1575), and Beza (died 1605).

Humanism as a movement was too deep and profound in character and too widespread in extent not to have its influence within the Catholic as well as the Protestant church, and this influence had its bearing too directly upon the study of the Scriptures not to affect significantly the course of this church's exegesis. The evidence of this is manifest in the period of the Counter-Reformation, and especially at its beginning. Cajetan (1469–1534), on the threshold of the period, was liberal as a commentator. He treated most of the New Testament books, including the Apocalypse, and did not hesitate to differ in his interpretations from schoolmen and fathers alike, while he wholly abandoned their allegorizing manner of work. With him stood Sodaletus (died 1547), whose scholarly method in his commentary on Romans (1535) brought him to such vigorous views of doctrinal truth as were possible with loyalty to the church, and Maldonatus (died 1583), one of the most brilliant lecturers on exegesis since Abélard's day, whose commentary on the Four Gospels (first published in 1596) shows not only a large freedom from the fathers, but a marked ability in the explanation of the literal sense of Scripture. To these might be added, even in the later years of the period, Estius (died 1613), Mariana (died 1624), and Menochius (died 1655). As the period progressed, however, the doctrinal definitions and elucidations of the Council of Trent led to stricter methods. This is seen particularly in the Jesuit scholars Bellarmine (died 1621), who after approved scholastic manner made the Scriptures an arsenal for the defense of the Catholic faith; and Cornelius à Lapide (died 1637), who turned to the fathers for his materials; while it evidences itself more or less in Tirin (died 1636), and even in the earlier writers, Emmanuel de Sa (died 1596) and Salmeron (died 1591). Against this dogmatic position the Quietistic movement, first formally introduced by a Spanish priest, Molinos (died 1696), was practically a protest, though its spirit in handling the Scriptures tended rather to vitiate than to vitalize the sounder methods of interpretation. This is marked in the later developments of the movement, as seen in Quesnel's (died 1719) *Moral Reflections on the New Testament* (1687), the exegesis of which disclosed an ascetic spirit, and Madame Guyon's (died 1717) explications of the Holy Bible (Paris, 1715), which ran riot in mystical extravaganzas.

A development somewhat similar to this in the Catholic church took place also in the Protestant church. At the beginning of the Reformation the supreme interest in the Scriptures brought them into a place of high regard. As the period progressed, however, this regard grew and intensified until it became at last a reverence that placed the Scriptures in a position of supreme authority for the life and faith of the church. In the same way the spiritual value given to the Scriptures at the first brought them into a place of practical ministry to the church's faith and life. But with the progress of the period this life and faith grew in doctrinal importance, until the ministry which the Scriptures rendered came to be one of support and proof for the church's dogmatic position. The return to allegorizing methods was in reality the threshold of this doctrinal development; but the full growth is seen in the scholastic exegesis of the seventeenth century, especially among the Lutherans. Gerhard (died 1637), in his most important work, *Commentary on the Harmony of the Gospel History of the Passion, Resurrection, and Ascension of Christ* (Jena, 1617), to which he added a completion of the Chemnitz-Leyser harmony, shows almost a pietistic spirit and evidences remarkable patristic learning, yet treats Scripture as throughout the canonically authoritative source for dogma; while Salomo Glass (died 1656), in spite of comprehensive knowledge and grammatical method, burdens his *Philologia Sacra* (Jena, 1623–36) with casuistry and allegorism; and Calovius (died 1686) conceived his chief exegetical work, *Biblia Illustrata* (Frankfort, 1672–76), in the bitterness of a dogmatic polemic, dragging Scripture down to a mere collection of proof texts for Lutheran orthodoxy. Against this dogmatism arose the same protest as in the latter stage of the Counter-Reformation. The first intimation of it appeared in Calixtus (died 1656), who took an irenic position between Lutherans and Reformed, a position based on a lower estimate of Scripture than was current in his day, in which the almost idolatrous reverence for the book was laid aside. This protest came to its full issue in the pietistic school of Spener (died 1705), who in his *Misused Bible Passages* (1693) subordinated the interpreting of Scripture for the sake of the creeds to the study of Scripture for the sake of the religious life. This principle was carried forward and developed by his pupils, Francke (died 1727), in his exegetical lectures at Leipzig (1689) and his various hermeneutical writings, and Anton (died 1730), in his Bible lectures at Halle (from 1695 on) and his occasional writings in the field of the devotional and practical life. In addition to these, Rambach (died 1735) produced in his *Institute of Sacred Hermeneutics* (Halle, 1724) and allied writings the first comprehensive presentation of the hermeneutical discipline, in which, however, the science of the study was endangered by the author's overpressure of the idea of inspiration. Midway between this confessional freedom of the Pietists and the symbol worship of the Lutherans stood Bengel (died

1752), whose *Gnomon of the New Testament* (Tübingen, 1742) is the best exegetical product of the period. He had no extravagant ideas of inspiration and yet was imbued with a profound sense of the religious value of the revelation contained in the words of Scripture; he was conscientious in the details of scholarship and yet comprehensive in the grasp of truth; he was finished in style and yet full of spiritual power.

This dogmatic development and reaction did not show itself so conspicuously among the Reformed exegetes, whether in Germany, Switzerland, or France. The New Testament work done by Paræus (died 1622), J. Cappel (died 1624), Piscator (died 1625), Raphel (died 1715), Lampe (died 1729), and Beausobre (died 1738), while burdened more or less with theological discussion and characterized by theological analysis, is nevertheless devoid of confessional motive and is remarkably true in method. Even in Holland, where the controversy between Arminians and Calvinists was bitter in the extreme, Bible interpretation was not distorted in the interests of party positions. This is evident on the Calvinist side in the exegetical work of Cocceius (died 1669), *Epistles, John's Gospel and Apocalypse*, and in the New Testament printed in his *Opera* (Amsterdam, 1676–78), which was directed against the dry scholasticism of Lutheranism and reinstated in a measure the early Reformation methods, though its excessive typology opened anew the way to the old error of allegorism. It was also evident in the work of his pupils Van Til (died 1713) and Vitringa (died 1722). On the Arminian side it was equally evident in the great interpretative production of Grotius (died 1645), *Annotations on the Old and New Testament*, printed in *Opera* (Amsterdam, 1679), which in its method was free from the control of dogmatic prepossessions, the author's aim being to get at the plain historical sense of Scripture. The further fact that, among Reformed scholars generally, there was produced a class of books called *Observations*, which, while contributing to various phases of Bible study, such as philology, chronology, geography, and natural history, did so along exegetical lines, is clear proof of how scholarly their method was and how free it stood from the slavery of symbolism. Workers in this latter field were Scaliger (died 1609), Casaubon (died 1614), Drusius (died 1616), Bochart (died 1667), and Elsner (died 1750), to whom should be added Wetstein (died 1754), whose critical edition of the New Testament (1751–52) was one of the greatest contributions to biblical scholarship in the century.

In England Lutheran scholasticism, with the accompanying protest against it, did not appear. There were all phases of theological belief, from hyper-Calvinism to Arianism, but Bible study preserved itself from confessionalism. Nothing more practical and devotional—and often nothing more scholarly—exists than the work of the English exegetes of the seventeenth and eighteenth centuries, as Hall (died 1656), Hammond (died 1660), Trapp (died 1669), Lightfoot (died 1675), Poole (died 1679), Pearson (died 1686), Henry (died 1714), Whitby (died 1726), Doddridge (died 1751), Lowman (died 1752), and Gill (died 1771).

Against all the dead scholasticism of German orthodoxy the devotional impulse of pietism was of no permanent avail. Its power was fully broken only by the deeper-reaching principles of the rationalism represented by such philosophers as Wolff (died 1754) and Lessing (died 1781), and reproduced in the work of such exegetes as Semler (died 1791), Eichhorn (died 1827), and Eckermann (died 1836)—a group of scholars whose New Testament expository work was founded on the idea, not only that the Apostles and Evangelists were influenced by their Jewish surroundings, but that their writings could be properly interpreted only from the viewpoint of these surroundings. The influence of Semler, *Preparation for New Testament Hermeneutics* (Halle, 1760), and his *Commentaries on John's Gospel, Romans, and Corinthians* (Halle, 1770–76), was significant and can be said to have prepared the way for all the later work of New Testament criticism, while in turn their inspiration may be assigned to Baumgarten (died 1767), *Exposition of the Holy Scriptures* (Halle, 1742), and of *Paul's Epistles* (ib., 1749–67), who properly represents the translation from pietism to rationalism. To this group should be added Gabler (died 1826) and Paulus (died 1851), scholars more extreme in their views, whose New Testament commentaries and hermeneutical writings, while marked by learning and critical skill, were thoroughly committed to a naturalistic exegesis and sympathized with the mythical principles of Strauss (died 1874). Fritzsche (died 1846), whose commentaries on *Matthew* (1826), *Mark* (1830), and *Romans* (1836–43) are characterized by great philological ability, alone seems to have been uninfluenced by this rationalism, unless with him might be classed the earlier writer Koppe (died 1791), whose contribution (*Galatians, Ephesians, Thessalonians,* and *Romans*) to the *Greek New Testament with Annotations*, projected by Heinrichs and Pott, but not completed (Göttingen, 1783–98), is a piece of careful and impartial exegetical work; while Herder (died 1803) shows in his *Explanations of the New Testament* (Riga, 1775), *Letters of Two Brothers of Jesus* (Lemgo, 1775), and *Apocalypse* (London, 1821), a combination of rationalistic and mystical elements that makes him a forerunner of the Schleiermacher school, to which school should be assigned the later scholar De Wette (died 1849), whose *Exegetical Handbook on the New Testament* (Berlin, 1836–48) is remarkable for its religious convictions and its naturalistic results.

Naturally this rationalistic movement aroused orthodoxy to protest; but orthodoxy's dying powers were not equal to anything more than a feeble effort. In fact, the scholarly work of such men as Ernesti (died 1781), *Institutes of the New Testament Interpreter* (Leipzig, 1761) and *Academic Lectures on Hebrews* (ib., 1815); his pupils, Morus (died 1792) and K. A. G. Keil (died 1818); and of J. D. Michaelis (died 1791), *Paraphrase of the New Testament, with Annotations* (Göttingen, 1790–91), all of whom belonged to orthodoxy and sought to defend it, proved silent confessions of the hopelessness of the cause and added rather to the rationalistic impulse. Ernesti's New Testament work, indeed, formed an epoch in hermeneutics by establishing the principle that Scripture has but a single sense—a literal one—and that this sense can be discovered only by the same means as are applicable to an ordinary human book; but this principle, derived really from Wetstein (died 1754), was in fact more opposed to the mysticism of pietistic interpretation than it was to the realism of rationalistic exposition. It was the foundation of the subsequent school of grammatico-historical exegesis, which was developed more fully by his immediate pupils, Morus and Keil. As a consequence, the later members of this defensive group, J. G. Rosenmüller (died 1815), and especially Kuinoel (died 1841), were more in sympathy with rationalism than they were with orthodoxy.

The defense of the older Tübingen school differed from this weak effort of orthodoxy, inasmuch as its purpose was to support a supernatural Christianity rather than an authoritative confessionalism. Its best representatives in New Testament exegesis are Storr (died 1805), *Commentary on Hebrews* (Tübingen, 1789); his pupil J. F. Flatt (died 1821), Commentaries on most of the Epistles (ib., 1825–31), and Hess (died 1828), *Commentary on Acts* (Zurich, 1775) and *Life of Jesus* (ib., 1781). But here, too, the late members of the school—e.g., the younger Bengel (died 1826) and Steudel (died 1837)—became more independent and were allied rather with the naturalism against which they were supposed to stand.

What an orthodox and even a supernaturalistic exegesis were not able in themselves to effect against rationalism, however, was being brought about by the critical philosophy of Kant (died 1804), which in its unconscious emphasis of skepticism destroyed the confidence in reason as the criterion of revelation. The destructive efforts of this philosophy were supplemented constructively by the school of Schleiermacher (died 1834), who, standing in the midst of the rationalistic and evangelical struggle, semed to partake of both tendencies and yet belonged really to neither. His New Testament exposition, limited in amount (*Commentary on Timothy*, Berlin, 1807; *Hermeneutics*, ed. by Lücke, ib., 1838; *Life of Jesus*, ed. by Rutenik, ib., 1864), is not the most valuable part of his work; but its influence on subsequent exegesis was pronounced. This is evident in the exegetical writings of Olshausen (died 1839; *Commentary on the New Testament*, continued by Ebrard and Wiesinger, trans., Edinburgh, 1847–49; *A Word on the Deeper Sense of Scripture*, ib., 1824; *The Biblical Exposition of Scripture*, Hamburg, 1825); Neander (died 1850; *Commentary on I. John, Philippians, and James*, trans., New York, 1859; *Life of Jesus*, trans., London, 1848); Lücke (died 1855; *Commentary on the Writings of John*, trans., Edinburgh, 1837; *Elements of New Testament Hermeneutics*, ib., 1816); Rückert (died 1871; *Commentary on Romans*, Leipzig, 1839; *Galatians*, ib., 1833; *Ephesians*, ib., 1834; *Corinthians*, ib., 1836–37); Tholuck (died 1877; *Commentary on Romans*, trans., Edinburgh, 1848; *John's Gospel*, trans., ib., 1836; *Sermon on the Mount*, trans., ib., 1860; *Hebrews*, trans., ib., 1852). It is true that none of these writers exactly represented Schleiermacher's position. They carried out his method of an organic interpretation of Scripture, but they developed it to evangelical degrees which Schleiermacher would not have accepted. This is particularly true of Tholuck, whose commentaries are deeply spiritual in tone and based on a profound conviction of the divine authority of Scripture, though free from any mechanical idea of inspiration.

Yet even the power of this profoundly influential school of exegetes was not sufficient to stop the skeptical impulses started by Kant's philosophy. Even before Schleiermacher's death these had worked themselves out into the systems of Fichte (died 1814) and Hegel (died 1831), the latter of which afterward formed the background for the mythical theory of Strauss (died 1874; *Life of Jesus*, trans., London, 1846) and the critical work of the later Tübingen school of Baur (died 1860; *Paul the Apostle*, trans., London, 1873–75). This school devoted itself to church history and criticism rather than to exegesis. Only the following adherents of Baur can be said to have contributed specifically to New Testament exposition: Volkmar (died 1872; *Commentary on Apocalypse*, Tübingen, 1862; *Romans*, Zurich, 1875); Holsten (died 1897; *Commentary on Galatians*, Rostock, 1859; exposition of *Galatians*, *Corinthians*, and *Romans*, in his *Gospel of Paul*, i, Berlin, 1880; part ii posthumously, ib., 1898). At the same time, however, it carried out to its results Semler's principle of the emphasis of the historical element in New Testament interpretation, but with such a skeptical attitude of mind towards the New Testament itself as to arouse the definite and distinct opposition, not only of the closer followers of Schleiermacher, but also of a group of exegetes who, while not so profoundly influenced by Schleiermacher's spirit, yet followed in the way of his organic treatment of Scripture. The better representatives of this group are: Winer (died 1858; *Exegetical Studies*, Leipzig, 1827; *Commentary on Galatians*, ib., 1859); Bleek (died 1859; *Commentary on Hebrews*, Berlin, 1828–40; *Lectures on the Apocalypse*, ib., 1862; *Colossians, Ephesians, Philemon*, ib., 1865; *Hebrews*, Elberfeld, 1868; *Synoptical Explanation of the First Three Gospels*, Leipzig, 1862); H. A. W. Meyer (died 1873), editor of the *Critical Exegetical Commentary on the New Testament* (trans., Edinburgh, 1873 et seq.), to which he personally contributed in the first edition *Matthew*, *Mark*, *Luke*, *John*, *Acts*, *Romans*, *Corinthians*, *Galatians*, *Ephesians*, *Colossians*, *Philemon*, and *Philippians;* Beck (died 1878; *Exposition of Epistles to Timothy*, Gütersloh, 1879; *Apocalypse*, ib., 1883; *Commentary on Apocalypse*, ib., 1884; *Exposition of Romans*, ib., 1884; *Ephesians*, ib., 1891; *Epistles of Peter*, ib., 1896); Lange (died 1884), editor of the *Commentary on Holy Scripture* (trans., New Testament portion, Edinburgh, 1861–65), to which he personally contributed *Matthew*, *Mark*, *John*, *Romans*, *James*, and *Apocalypse;* Lechler (died 1890; *Commentary on Acts*, in Lange, Bielefeld, 1860); Ebrard (died 1888; *Commentary on Hebrews*, Königsberg, 1850; *Apocalypse*, ib., 1853; *The First Three Gospels*, trans., Edinburgh, 1853; *Epistles of John*, ib., 1859; *Gospel of John*, ib., 1860); Beyschlag (died 1900; *The Pauline Theodicy*, Berlin, 1869; *The Parables of Jesus*, trans., Edinburgh, 1875; *Commentary on Apocalypse*, ib., 1876; *Commentary on James*, in the last ed. of Meyer, Edinburgh, 1897); B. Weiss (*Commentary on Philippians*, Berlin, 1859; *The New Testament Text Critically Investigated, with Exegetical Notes*, ib., 1894–1900; *Commentaries on Matthew*, *Mark*, *Luke*, *John*, *Romans*, *Hebrews*, and *Epistles of John*, in the last ed. of Meyer, 1893–1901); Heinrici (*Commentary on Corinthians*, 1880–87; *Corinthians*, in the last ed. of Meyer, 1896–1900).

Along with this opposition arose a more thoroughgoing one in the strictly conservative school of Hengstenberg (died 1869; *Commentary on Apocalypse*, trans., Edinburgh, 1851; *Gospel of John*, trans., ib., 1865), to which more distinctly belonged: Stier (died 1862; *Words of the Lord Jesus*, trans., Edinburgh, 1869; *Apostles*, ib., 1869; *Angels*, London, 1887; *Commentary on Hebrews*, Brunswick, 1862; *James, Epistles of Peter and Jude*, Berlin, 1850); Philippi (died 1882; *Commentary on Romans*, Gütersloh, 1878; *Galatians*, ib., 1884); K. F. Keil (died 1888; *Commentary on Matthew*, Leipzig, 1877; *Mark and Luke*, ib., 1879; *John*, ib., 1881; *Peter and Jude*, ib., 1883; *Hebrews*, ib., 1885). To these should be added the following later writers, belonging to the same general conservative attitude, though varying among themselves as to their degree of conservatism: Franz Delitzsch (died 1890), whose chief New Testament work was a *Commentary on Hebrews* (trans., Edinburgh, 1868–70); Luthardt (*Commentary on John's Gospel*, Nuremberg, 1852–53; *Apocalypse*, Leipzig, 1861; *Commentary on John's Gospel and Acts*, with Zöckler, trans., Edinburgh, 1878–79; *John's Epistles and Romans*, in Strack and Zöckler, Munich, 1886–88); Nösgen (*Commentary on Acts*, Leipzig, 1882; *Commentary on Matthew, Mark, and Luke*, in Strack and Zöckler, Munich, 1886–88); Zöckler, editor with Strack of the *Concise Commentary on the Holy Writings of the Old and New Testaments* (Munich, 1886–88), to which he personally contributed *John's Gospel* and *Acts* (with Luthardt), *The Pastoral Epistles, Hebrews and Apocalypse* (with Riggenbach), *Thessalonians* and *Galatians* in the last edition (Munich, 1894–98). Apart from all schools, occupying an unaffiliated and isolated position, yet bitterly hostile to the Tübingen school, is to be placed Ewald (died 1875; *Commentary on the Apocalypse*, Leipzig, 1828; *Exposition of the First Three Gospels*, Göttingen, 1850).

In this struggle the followers of Baur were not able to maintain their critical position, but abandoned several points regarded as of importance, suffering their greatest defeat in the defection from their ranks of Ritschl (died 1889), who, in the second edition of his *Old Catholic Church* (Bonn, 1857), undertook to show that the historical premises on which the exegesis of the school was founded were false. While the change in position on the part of such eminent disciples of Baur as Holtzmann (died 1910), Hilgenfeld (died 1907), and Pfleiderer (died 1908) did not radically affect their approach to the problems of exegesis, and those influenced by Ritschl did not accept all of his conclusions on isagogical questions, the general effect was the rise of a school of exegesis characterized by a strict historico-critical method, but also by an increased emphasis on the religious evaluation reminding of the attitude of Schleiermacher. This school, though differing from many of Baur's conclusions and conscious of his limitations, yet recognizes his great services and quite agrees with Jülicher that "he has taught us to appreciate the books of the New Testament in a truly historical way, as products of the spirit of Christianity at a definite time and as witnesses for it." It has gained great influence and may be said to control the New Testament interpretation of to-day. The more prominent exegetes in recent years have been: H. J. Holtzmann, editor of the *Hand Commentary to the New Testament* (Freiburg, 1889–91), to which he contributed personally in the first edition *Matthew, Mark, Luke, John's Gospel and Epistles, the Apocalypse*, and *Acts;* Lipsius (died 1892; *Commentary on Romans, Galatians, Philippians*, 1st ed. of Holtzmann, ib., 1891); Schmiedel (*Commentary on Corinthians and Thessalonians*, 1st ed. of Holtzmann, ib., 1890); Von Soden (*Commentary on Ephesians, Colossians, Philemon, Timothy, Titus, Hebrews, James, Peter, and Jude*, 1st ed. of Holtzmann, ib., 1891); Wendt (*Acts*, 9th ed. of Meyer, Göttingen, 1913); B. Weiss (*Matthew*, 10th ed. of Meyer, ib., 1910; *Mark and Luke*, 9th ed., ib., 1901; *John*, 9th ed., ib., 1902; *Romans*, 9th ed., ib., 1899; *Timothy and Titus*, 7th ed., ib., 1902; *Hebrews*, 6th ed., ib., 1897; *Johannine Epistles*, 6th ed., ib., 1900); J. Weiss (*I Corinthians*, 9th ed. of Meyer, ib., 1910; *The Apocalypse*, ib., 1904; ed. of *Schriften des N. T.*, 1906 ff.); E. Haupt (*The Captivity Epistles of Paul*, 8th ed. of Meyer, ib., 1902); Heinrici (*II Corinthians*, 8th ed. of Meyer, ib., 1900); Bousset (*The Apocalypse of John*, 6th ed. of Meyer, ib., 1906); Dobschütz (*Thessalonians*, 7th ed. of Meyer, ib., 1909); Beyschlag (*James*, 6th ed. of Meyer, ib., 1908); Knopf (*Peter and Jude*, 7th ed. of Meyer, ib., 1912); Sieffert (*Galatians*, 9th ed. of Meyer, ib., 1899). A more conservative standpoint is occupied by Theodor Zahn, who, in addition to his learned investigations as to the Canon and his *Introduction to the New Testament* (Leipzig, 1900), has recently begun the publication of a series of Commentaries to which he has himself contributed one on *Luke* (ib., 1913), and Riggenbach one on *Hebrews* (ib., 1913). Valuable contributions were made by Hilgenfeld, who for half a century published the *Zeitschrift für Wissenschaftliche Theologie;* by Pfleiderer, through his work *Das Urchristentum* (2d ed., Berlin, 1902); by Harnack, whose *Beiträge zur Einleitung in das Neue Testament* (Leipzig, 1906–12) has furthered especially the interpretation of the synoptic Gospels and Acts; by Hans Lietzmann, editor of a *Handbook to the New Testament* (Tübingen, 1906 ff.), of which three volumes were out in 1914; by Adalbert Merx (died 1909), whose commentaries on the Sinaitic Syriac of *Matthew* (Berlin, 1902), *Mark and Luke* (ib., 1905), and *John* (posthumously, ib., 1912) are unique in their mastery of the early versions; and by Julius Wellhausen, whose *Introduction to the Three First Gospels* (Berlin, 1905) and commentaries on *Mark* (ib., 1903), *Matthew* (ib., 1904), *Luke* (ib., 1904), and *John* (ib., 1908) have stimulated research in these fields. The last great edition of the text by Von Soden was completed in 1913, under the title *Die Schriften des Neuen Testaments in ihrer ältesten erreichbaren Textgestalt* (Göttingen, 1913).

In France Renan (died 1892) interpreted the life of Jesus (*Vie de Jésus*, Paris, 1863) and the history of the early Church (*Histoire des origines du christianisme*, ib., 1886); Albert Réville (died 1906) published his studies of the New Testament in *Essais critiques sur St. Matthieu* (ib., 1860), *Origines du Nouveau Testament* (ib., 1864), and *Jésus Christ* (2d ed., ib., 1906); his son, Jean Réville (died 1908), occupied himself especially with John (*La doctrine du Logos*, ib., 1881; *Le quatrième évangile* 2d ed., ib., 1902); the conservative scholar F. Godet published commentaries on *Luke* (trans., Edinburgh, 1875), *John* (trans., ib., 1879–80), *Romans* (trans., ib., 1880), and *I Corinthians* (trans., ib., 1886); and the modernist Alfred Loisy has written *Histoire da canon du Nouveau Testament* (ib., 1891), *L'Evangile et l'église* (ib., 1902), *Etudes évangeliques* (ib., 1902), *Le quatrième évangile* (ib., 1903), *Les évangiles synoptiques* (ib., 1908). In Holland conservative exegesis was represented by Van Oosterzee (died 1882) in his Commentary on *Luke* (trans., Edinburgh, 1863), the *Pastoral Epistles*, and, with Lange, *James* (ib., 1858–62). The "founder of the Leyden School," J. H. Scholten (died 1885), published an Introduction (2d ed., Leyden, 1856), *Het evangelie naar Johannes* (ib., 1864), *Het oudste evangelie* (ib., 1864), *Het Paulinisch evangelie* (2d ed., ib., 1873). W. C. Van Manen (died 1905) occupied a more radical standpoint in his *Handleiding voor de oudchristelijke letterkunde* (ib., 1900), *Paulus* (ib., 1890–96), and in *Encyclopædia Biblica;* and J. M. S. Baljon (died 1908) made valuable contributions in his *Inleiding der boeken des N. T.* (Utrecht, 1903), *Grieksch-theologisch wordenboek* (ib., 1895–99), and *Geschiedenis van de boeken des N. T.* (ib., 1901) and his commentaries on *Matthew* (Groningen, 1900), *John* (Utrecht, 1902), *Acts* (ib., 1903), and the *Catholic Epistles and Philippians* (ib., 1904).

The New Testament exegesis produced in Great Britain and America during the earlier part of the nineteenth century was not noticeably affected by the English deism which closed the century preceding, nor to any degree by the various rationalistic movements which so profoundly influenced the exegesis of Germany. In Great Britain such writers as Scott (died 1821; *Family Bible*, London, 1796–1825) and Adam Clarke (died 1832; *Commentary on the Holy Bible*, ib., 1810–26) continued the popular work of Henry, Doddridge, and Gill, but with better critical results. Scholars like Alford (died 1871; *The Greek New Testament with Commentary*, London, 1849–61), Ellicott (*Commentary on Galatians*, Cambridge, 1854; *Ephesians*, ib., 1855; the *Pastorals*, ib., 1856; *Philippians, Colossians, Philemon*, ib., 1857; *Thessalonians*, ib., 1858; *I Corinthians*, London, 1887), J. B. Lightfoot (died 1889; *Commentary on Galatians*, London, 1865; *Philippians*, ib., 1868; *Colossians, Philemon*, ib., 1875; *Notes on Paul's Epistles*, ib., 1895), Westcott (died 1901; *Commentary on John's Epistles*, ib., 1883; *Hebrews*, ib., 1889; *John's Gospel*, ib., 1892), Eadie (died 1876; *Commentary on Colossians*, ib., 1856; *Philippians*, ib., 1859; *Ephesians*, ib., 1861; *Galatians*, ib., 1869; *Thessalonians*, ib., 1877), Plumptre (died 1891; *Commentary on Acts*, Cambridge, 1879; *Mark*, ib., 1879; *II Corinthians*, ib., 1883), and MacPherson (*Commentary on Ephesians*, Edinburgh, 1892), produced works of permanent value, though generally conservative in their attitude. Stanley (died 1881; *Commentary on Corinthians*, London, 1862) and Jowett (died 1893; *Commentary on Galatians, Romans, Thessalonians*, ib., 1859) represent a freer tendency. In America New Testament exegesis was perhaps more conservative, though, with noted exceptions, not so remarkable for scholarship. Its best representatives were: Moses Stuart (died 1852; *Commentary on Hebrews*, Andover, 1827–28; *Romans*, ib., 1832; *Apocalypse*, ib., 1845; *Principles of Interpretation*, from the Latin of Ernesti, ib., 1842); J. A. Alexander (died 1860; *Commentary on Acts*, New York, 1856; *Mark*, ib., 1858; *Matthew*, ib., 1860); Hackett (died 1875; *Commentary on Acts*, Boston, 1851; *Philemon*, New York, 1860); C. Hodge (died 1878; *Commentary on Romans*, Philadelphia, 1835; *Ephesians*, New York, 1856; *Corinthians*, ib., 1857–59); Cowles (died 1881; *Notes on the Old and New Testaments*, New York, 1867–81); Conant (*Annotated Version of Matthew*, ib., 1860; *Revised Version of the New Testament, with Notes*, ib., 1866); Broadus (died 1895; *Commentary on Matthew*, Philadelphia, 1886); Hovey, editor of the *American Commentary on the New Testament* (ib., 1887–90), to which he personally contributed *John's Gospel* and *Galatians* (1890).

The growing needs of Sunday-school work produced in America a class of popular exegetical works for the use of teachers and older scholars in the school, such as Barnes's (died 1870) *Notes on the New Testament* (New York, 1832–52); Jacobus' (died 1876) *Notes on the Gospels* (ib., 1848–56) and *Acts* (ib., 1859). At the present time in Great Britain these needs are met by such series as the *Handbooks for Bible Classes and Private Students*, ed. by Marcus Dods and Alexander Whyte (London, 1879–85); *The Cambridge Bible for Schools and Colleges*, ed. by J. J. S. Perowne (ib., 1878–1901); also, by the same editor, *The Cambridge Greek Testament for Schools and Colleges* (ib., 1881–91). In America F. N. Peloubet has produced since 1875 a series of compilative *Notes on the Sunday School Lessons*. In the same popular line, though for more general use, are: In Great Britain, *The Pulpit Commentary* (London, 1880 et seq.), ed. by Canon Spence and J. S. Exell; *The Library Commentary*, by Jameson, Fausset, and Brown (ib., 1871); *Commentary for English Readers* (ib., 1877–79), by Bishop Ellicott; *Biblical Museum* (ib., 1871–81), ed. by J. C. Gray; *The Expositor's Bible* (ib., 1888 et seq.), ed. by W. Robertson Nicoll. In America: *Commentary on the Old and New Testaments* (New York, 1874–86), ed. by D. D. Whedon; *Bible Work* (ib., 1887 et seq.), by J. G. Butler. For more advanced scholarly use is *The Holy Bible* (*Speaker's Commentary*, London, 1871–82), ed. by Canon Cook (died 1889). In the latter part of the nineteenth century and the beginning of the twentieth the influence of the historico-critical school in Germany was more distinctly felt in England and America. In the front rank of critical and exegetical scholarship of the present time stands *The International Critical Commentary* (New York, 1895 et seq.). The New Testament books so far produced are: *Mark*, by E. P. Gould (died 1902); *Luke*, by Alfred Plummer; *Romans*, by William Sanday; *Philippians and Philemon*, by Marvin R. Vincent; *Ephesians and Colossians*, by T. K. Abbott; *Peter and Jude*, by Charles Bigg; *I Corinthians*, by Robertson and A. Plummer; *Matthew*, by Allen; *I–II Thessalonians*, by Frame; the *Johannine Epistles*, by Brooke. With this may be ranked, in a way, the more concise but none the less scholarly reworking of Alford's *Greek Testament*, under the title *The Expositor's Greek Testament* (London, 1897 et seq.; New York, 1900), ed. by W. Robertson Nicoll. More radical are the commentaries in the *International Handbooks to the New Testament* (London, 1900 et seq.), ed. by Orello Cone. The modern critical standpoint is also maintained in the *Bible for Home and School* (New York, 1908–13), in which *Matthew* is by Robertson (1911), *Acts* by Gilbert (1908), *Colossians and Ephesians* by Alexander (1910), *Galatians* by Bacon (1909), and *Hebrews* by Goodspeed (1908). Benjamin W. Bacon in America and James Moffatt in England have dealt especially with isagogical questions, and made many valuable contributions. The coöperation of Semitic scholarship in the interpretation of the Gospels is exemplified in *The Prophet of Nazareth* (New York, 1905; 2d ed., 1907), by Nathaniel Schmidt; and the participation of Jewish scholars in this work by *The Synoptic Gospels* (London, 1909 et seq.), by Claude C. Montefiore.

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EXELMANS, āg'zĕl'mäNs', Rémy Joseph Isidore, Comte (1775–1852). A marshal of France. He was born at Bar-le-Duc, in the Department of Meuse, and entered the army in 1791. He was promoted to the rank of captain in 1799, served with distinction in the campaign in Naples under Macdonald and Championnet, and in 1801 was attached as aid-de-camp to the staff of Murat. In 1808, while with Murat in Spain, he was captured and sent to England, where he remained a prisoner for three years. Escaping, he rejoined Murat, who had become King of Naples and who established him at his court. But he left Italy to serve with Napoleon in the Russian campaign in 1812. For his brilliant conduct the Emperor created him general of division and grand officer of the Legion of Honor. He was active in the Dutch campaign of 1814, and after Elba Napoleon named him a peer of France. Under the régime of the Restoration after the fall of Napoleon in 1815, attempts were made to win him to the Bourbon side, but his negotiations with Murat resulted in his exile from France. He was permitted to return after several years, and in 1831 Louis Philippe restored him to the Chamber of Peers, and under the presidency of Louis Napoleon he was made Grand Chancellor of the Legion of Honor and marshal of France.

EXEMP'TION (Lat. *exemptio*, from *eximere*, to take out, from *ex*, out + *emere*, to take, buy). The legal right to be excused from rendering certain services to the state, or to receive or retain certain property free from the claims of others. It is secured by a variety of statutes (popularly called exemption laws). Some of these designate the persons or classes who are not liable to jury duty or to military service. Others specify the portion of a decedent's estate which is to be set apart for the use and benefit of the widow and children, and which they are allowed to retain even in preference to the creditors of the deceased. Still others describe the property of a tenant which is free from distress for rent, or the property which is free from taxation, or from seizure under execution, or which may be retained by a bankrupt free from liability for his debts.

These statutes differ greatly in detail, but all have the common object of saving the family of a debtor from penury. The articles most generally exempted are necessary household furniture, tools used in a trade, a team, certain domestic animals, and a limited quantity of food supplies for the debtor's family. In some of our States the tendency is to increase exemptions unduly; but in all the courts are agreed that the policy of exemption is humane and wise, and that exemption laws should be very liberally construed. Certain laws protect a debtor and his family against an improvident attempt on his part to waive the benefit of the statute. For the particular exemption laws of any State, consult the statutes of that State, or Hubbell, *Legal Directory for Lawyers and Business Men* (New York, annually). See HOMESTEAD.

EX'ERCISE (Lat. *exercitium*, exercise, from *exercere*, to exercise, from *ex*, out + *arcere*, to ward off). An important element in the preservation of health and the prevention and cure of disease. The physiological effects of exercise when taken in proper therapeutic quantities are increased excretory activity, together with a correspondingly increased demand for oxygen and food. Cellular destruction and rebuilding —katabolism and anabolism—are stimulated. The immediate phenomena of general muscular exercise are increase in the respiratory movements, in the heart action, and in the production of sweat. Appetite is stimulated, sleep promoted, and nervous equilibrium preserved. Authorities are agreed that regular exercise strengthens the defensive powers of the body against disease; i.e., a certain degree of immunity is conferred. Outdoor exercise, particularly when connected with some form of game, such as golf or tennis, which engrosses the mental faculties, is most beneficial. In the treatment of diseases exercise has to be definitely prescribed. In the treatment of chronic heart disease from general obesity or fatty degeneration, it has been reduced to a system. Hypertrophy of the heart from gout, and chronic valvular disease, especially when symptoms of dropsy, renal disturbance, bronchial congestion, or catarrh are present, are markedly improved by specified exercises taken under careful direction. Other conditions which are benefited are chronic bronchitis, atonic dyspepsia, hepatic congestion, constipation, and anæmia. In certain cases of excessive weakness, advanced cardiac or kidney disease and obesity, passive exercise must be relied upon for a time at least. Passive movements are also largely employed to relax stiffened joints, restore paralyzed muscles, and correct deformity. A series of ingenious and highly complex machines have been invented for this purpose. In other cases massage, electricity, and resistance exercises are indicated. All of these must be carefully adopted to meet the conditions present. When indulged in to excess, exercise is capable of producing serious harm. Among the commonly observed injurious effects are muscular hypertrophy, succeeded by dilatation, of the heart, arteriosclerosis, hernia, etc. Overexercise is dangerous in such conditions as endocarditis, myocarditis, tuberculosis of the lungs and joints, chronic bronchitis, varicose veins, chronic appendicitis, chronic nephritis, and flat foot. In women uterine displacement is sometimes made worse. In all cases exercise must be carefully prescribed and at times interdicted altogether. For the forms and methods of exercise, see GYMNASTICS; PHYSICAL TRAINING. Consult chapters on exercise in Hare's *Modern Treatment*, vol. i (New York, 1910).

EXETER. A city and a county and parliamentary borough and river port, geographically in the County of Devon, England, on the Exe, 10 miles northwest of its mouth, 172 miles west-southwest of London, and 73 miles southwest of Bristol (Map: England, C 6). It is the county town of Devonshire. Exeter is a quaint old town, picturesquely situated on a broad ridge of land amid hills. Its principal edifice is the cathedral, begun in 1100 and famed for the beauty of its design and the richness of its decorations. Its distinguishing external features are the two transeptal towers, a unique conception of English cathedrals, dating from the early part of the twelfth century, and the beautifully ornamented west front added in the fourteenth century. The dimensions are 408 feet in length by 140 feet across the transepts. The interior is notable for its fine proportions and perfect symmetry. Its special features are the long, unbroken roof, carved minstrels' gallery, the bishop's throne with a lofty spirelike canopy, the sculptured stone choir screen, and the modern reredos. The architectural symmetry and decorative harmony of the church are perhaps unsurpassed in England. The chapter house, with a magnificent ceiling, contains a fine library, and among many valuable ancient manuscripts is Leofric's celebrated book of Saxon poetry. In the cathedral close are the episcopal palace and deanery.

High Street contains many ancient buildings, the finest being the Guildhall, whose upper story projects over the sidewalk and forms an arcade supported by pillars. On an eminence near one of the railway stations are the ruins of Rougemont Castle, built by William the Conqueror, and remains of the ancient city walls. Part of the castle grounds now constitutes Northernhay Park. Among other buildings are St. John's Hospital, founded in the reign of Henry III, the Albert Memorial Museum, opened in 1868, the Victoria Hall, lunatic asylum, and almshouses. Exeter owns its water supply and an electric plant. It maintains a technical college, public library and museum, public baths and washhouses, parks, an asylum, markets, a septic tank system of sewage treatment, and a cemetery. It sends one member to Parliament. Exeter has a large floating basin accessible to vessels of 350 tons, a canal extending to Topsham, accessible to vessels of 14-foot draft, and extensive rock-hewn wine vaults bordering its quay. It carries on a considerable shipping trade. Exeter has unsurpassed nurseries and exports dairy, farm, and orchard produce. Its manufactures include gloves, agricultural implements, beer, paper, and iron goods. It is the chief market for the celebrated Honiton lace. Exeter is on the Great Western and the London and South Western railways. The city embraces 3166 acres; pop., 1891, 45,766; 1901, 47,185; 1911, 48,664 (the increase in each decade being 3.1 per cent). The civil parish of St. Thomas the Apostle, on the right bank of the Exe, is a part of Exeter. Its area is 1270 acres; pop., 1901, 9457; 1911, 11,381.

In early times Exeter, the *Caer Isc* of the Britons, was most probably an important centre of trade with the Greeks and the Phœnicians. To the Romans it was known as *Isca Damnoniorum*. Exeter was for a long time the centre of British resistance to the Anglo-Saxon invaders, and in 926, when Athelstan visited Exanceaster, he found it inhabited by British and Saxons alike. Athelstan surrounded the town with walls, so that it withstood an attack of the Danes in 1001. Two years later, however, they returned and plundered the town. In 1050

Exeter, as affording greater security, replaced Crediton as the episcopal see of Devonshire. The city was taken by the Conqueror in 1068 and by Stephen in 1137. During the Middle Ages it had a very important woolen trade, but later lost it. During the Civil Wars it was held by the Royalists from 1643 to 1646, when it surrendered to Fairfax. Consult: Oliver, *The History of the City of Exeter* (Exeter, 1821); id., *Lives of the Bishops of Exeter and History of the Cathedral* (London, 1861–81); Freeman, *History of Exeter* (ib., 1890); Prideaux and Shafto, *Bosses and Corbels of Exeter Cathedral* (ib., 1910).

EXETER. A town and one of the county seats of Rockingham Co., N. H., 25 miles (direct) east of Manchester, on the Squamscott River, and on the Boston and Maine Railroad (Map: New Hampshire, J 8). One of the oldest towns in the State, Exeter contains a large number of Colonial houses, a public library, and a hospital. The Phillips Exeter Academy (q.v.) and the Robinson Female Seminary are situated here. The river affords good water power, which is utilized in cotton manufacturing. Other important products are iron and brass goods, machinery, boxes, umbrellas, automobile tubes, asbestos and rubber novelties, casings, and shoes. The town was founded in 1638 by Rev. John Wheelwright, banished from Massachusetts, and was under the jurisdiction of Massachusetts from 1645 to 1680. During the Revolution it was the seat of the New Hampshire government. Pop., 1900, 4922; 1910, 4897. Consult Bell, *History of the Town of Exeter* (Exeter, 1888).

EX'ETER. A borough in Luzerne Co., Pa., about 10 miles west of Scranton, on the Lehigh Valley Railroad (Map: Pennsylvania, K 3). Points of interest in the vicinity are Fort Wintermooth and Scovill and Wintermooth islands, in the Susquehanna River. The borough is in a fertile agricultural and timber region, and coal mining is carried on. Pop., 1900, 1948; 1910, 3537.

EXETER BOOK, or CODEX EXONIENSIS. The name given to a manuscript anthology of Old English, or Anglo-Saxon, poetry, in possession of Exeter Cathedral. The volume has been identified with a book presented to the cathedral by Leofric, the first Bishop of Exeter (1050–72), and described as "One great English book on various topics, composed in verse." The manuscript, 55½×7½ inches, contains 123 leaves, or 246 pages, and is written on vellum. But for this volume, some of the finest Old English poems, as the *Christ*, would be lost to us. Consult: Gollancz, *The Exeter Book*, containing both the original text and a translation (London, 1895); the excellent account of the book and of Leofric in the introduction by Cook to Cynewulf's *Christ* (Boston, 1900); *Riddles of the Exeter Book*, ed. by F. Tupper, Jr. (New York, 1910); *Old English Riddles*, ed. by A. J. Wyatt (ib., 1912). See VERCELLI BOOK.

EXETER COLLEGE. A college of Oxford University. It was founded about 1314 by Walter de Stapeldon, Bishop of Exeter, for a rector, 12 scholars from the diocese of Exeter, holding degrees in arts, and a scholar chaplain. The foundation was a self-governing corporation, whose revenues, however, according to a somewhat frequent mediæval custom, were vested in another corporation, the dean and chapter of Exeter. Another curious provision was the annual election of the rector. The scholars first occupied two hostels, Hart Hall and Arthur Hall, and the establishment seems to have been called, from its founder, Stapeldon Hall. In 1565 Sir William Petre obtained a new charter for the foundation from Queen Elizabeth and completely reorganized it, on the model of other Oxford colleges. The scholars were removed to buildings on the present site of the college, the rector was made a permanent official, and the name was changed to Exeter College. Scholarships were added by Petre and others, among whom in later years Charles I was one, and the institution took on a new lease of life. The organization of the college was materially changed by the general readjustments in the university and colleges of recent years. New buildings have been added to the already picturesque quadrangle. Of these the chapel is especially noteworthy. It was designed by Scott and has, as part of its interior decoration, a piece of splendid tapestry, designed by Burne-Jones and executed by William Morris. Of the older buildings, the hall is one of the most notable in the university. Among the distinguished men who have been connected with the college are Archbishops Secker and Marsh; Bishops Conybeare, Bull, Mackarness, Prideaux, and Hall; Anthony Ashley Cooper, first Earl of Shaftesbury; John Ford the dramatist; Sir J. T. Coleridge, Lord Coleridge; J. A. Froude the historian; Burne-Jones, William Morris, F. D. Maurice, and Sir Charles Lyell. There were in the college, in 1913, 9 fellows, 8 honorary fellows, 50 scholars and exhibitioners, and a total of 212 undergraduates. Consult W. K. Stride, *Exeter College* (London, 1900).

EXETER, or **EX'ON, DOMESDAY.** See DOMESDAY BOOK.

EXETER HALL. A large building, formerly standing on the north side of the Strand, London, 131 feet long, 76 feet wide, and 45 feet high. It was built in 1831 for the use of religious and charitable societies and in 1880 purchased for the Young Men's Christian Association and used by that organization, and also leased for the May meetings of certain religious societies and for various musical organizations, the hall having a seating capacity of 5000. Often used by the dissenting bodies, by anti-slavery reformers, and by total-abstinence societies for great public meetings, "Exeter Hall" became a term to denote fanatical zeal, or the sort of moral earnestness regarded by conservative or conventional people as "bad form." In 1908 it was sold and demolished.

EXHAUS'TIONS (from Lat. *exhaurire*, to exhaust, from *ex*, out + *haurire*, to draw), METHOD OF. A mode of proving certain mathematical propositions, variously attributed to Antiphon and Bryson, Hippocrates and Eudoxus. The formal statement of this method may be found in Euclid, xii, 2. A familiar example is that of determining the area of a circle by means of the areas of circumscribed and inscribed polygons. The area of the circle lies between the areas of the polygons, and the latter approach indefinitely near it as the number of sides of the polygons is indefinitely increased. Archimedes used this plan in determining that π lies between $3\frac{1}{7}$ and $3\frac{10}{71}$. However, the idea of a circle being a polygon of an infinite number of sides is an essentially modern one, due chiefly to Kepler, and marks the passage of the method of exhaustions into the modern infinitesimal method. (See CALCULUS.) Consult: Chasles, *Aperçu historique* (3d ed., Paris, 1889); Heath, *The Thirteen Books of Euclid's Elements* (3 vols., Cambridge, 1908); Gow, *History of Greek Mathematics* (Cambridge, 1884).

EX'HIBI'TIONS (Lat. *exhibitio*, from *exhibere*, exhibit, from *ex*, out + *habere*, to have), ARCHITECTURE OF. The great international exhibitions, or world's fairs, have given rise to some of the most interesting and important developments of modern architecture along two divergent lines. The first exemplifies the effort towards a free, original, and logical expression in architectural form of the special conditions and materials of the building: this was illustrated in the iron and glass buildings of London (crystal palaces of 1851 and 1862), Paris (expositions of 1867, 1878, and 1889), Vienna (1873), and New York (1858); the stone, iron, and glass Palais de l'Industrie at Paris (1855), and the iron, timber, and glass buildings of the Philadelphia Centennial Exhibition of 1876. The second type of architecture is that which dresses the exterior of the buildings in a monumentally decorative apparel designed for æsthetic and monumental effects, quite independent of the materials employed. This type made its first appearance in the Columbian World's Fair at Chicago, the buildings of which were all designed as palaces of neoclassic architecture in external appearance, the interiors and roof construction being of iron, timber, and glass. Staff, a material composed largely of plaster of Paris, was employed for this exterior decorative architecture, and ever since has been largely used both in Europe and in America for this purpose. Not only the various American exhibitions (e.g., the Pan-American of 1901 at Buffalo and the Louisiana Purchase Exposition of 1904 at St. Louis), but most of the European exhibitions, of recent times, have followed the example of Chicago, notably the great Paris Exposition of 1900.

Of these two systems of design the first is the most logical; the second, proceeding upon the theory that an exhibition is a temporary affair of a more or less festival character, sacrifices logic to the production of a pleasing, festal, decorative ensemble, and makes free use to that end of perishable materials like staff and wood. Buildings and grounds are together treated in the spirit of a vast, artistic pleasure resort.

Nearly every great exhibition has occasioned the erection of at least one permanent building; the Memorial Art Gallery at Philadelphia, the Trocadéro hall and museum and the Eiffel Tower at Paris, the Grand and the Petit Palais in the same city, replacing the old Palais de l'Industrie, and the elegant Alexander III bridge across the Seine, the Columbian-Field Museum at Chicago, and the Art Gallery at St. Louis, are the permanent monuments of world's fairs in their respective cities.

The original conception of an exhibition housed all the exhibits under one roof, and Sir Joseph Paxton designed the first Crystal Palace (1851) as a single glazed shed, with a lofty arched nave and transept and numerous lower side aisles, constructed of a framework largely of cast iron with fillings of glass like a huge greenhouse. The exterior was the undisguised form resulting from this construction. In the next great exhibition, that of 1855 at Paris, the Palais de l'Industrie was built with stone walls, iron and glass being used for the interior courts and roof. That of 1867 in the same city was architecturally inconspicuous, consisting of concentric oval rings or aisles with plain gabled roofs. The Paris exhibitions of 1878 and 1889 displayed an earnest effort to produce a new and expressive architecture of metal and glass, with some use of brick and tile; but the results, though interesting, were not sufficiently monumental to win popular approval. One of the best of the single exhibition buildings of iron and glass, though a small one, was that of the New York exhibition in Bryant Park in 1858.

It was the Centennial at Philadelphia that inaugurated the system of separate buildings for distinct classes of exhibits, which has been followed by all world's fairs since that date except those of 1878 and 1889; but it was otherwise inconspicuous architecturally. Three years earlier for the Vienna exhibition of 1873 the English engineer Scott Russell had constructed a rotunda 324 feet in diameter, with a conical roof of iron and glass, the broadest space ever covered, up to that time, by a roof without intermediate supports. This was surpassed at Paris in 1889 by the great Salle des Machines, with a clear span of over 360 feet; and this again by the central hall of the Liberal Arts Building at Chicago in 1893, 1300 feet long and 386 feet wide, the largest area ever covered by a roof of a single span. But in the artistic use of metal in the interior construction of exhibition buildings the French have always led the world. In the Salle des Machines, above referred to, the circular Salle des Fêtes of 1900, and the interiors of the two palaces (Grand Palais, Petit Palais) remaining from that exhibition as permanent monuments, they produced admirable examples of artistic construction in metal and glass quite unequaled elsewhere. See EXHIBITIONS.

EXHIBITIONS, INDUSTRIAL. The beginning of these exhibitions may be traced to the so-called "fairs" held in the earlier periods of civilization, both in Asia and in Europe. These are supposed to have originated in religious gatherings, which first gave an opportunity for the exhibition and sale of wares to large numbers of people. From Italy they passed to France, where in 620 that of Saint-Denis was instituted by Dagobert. Those of Aix-la-Chapelle and Troyes date from about 800, and they were introduced into Great Britain by Alfred the Great in 886. Towards the close of the tenth century they became common throughout northern Europe. Such fairs are still prevalent in Holland, although Germany is best known as the modern home of these institutions. The fair of Leipzig, e.g., which dates from the twelfth century, is held three times a year, and attracts from 25,000 to 30,000 foreign merchants at each gathering. The great Russian fair at Nizhni Novgorod occurs in July and August, and the sales during its continuance are said to amount to many millions of dollars. The improvements in the methods of commerce have led to the institution of the more recent industrial exhibitions. These have for their chief object, not the immediate sale of articles, but their exhibition to visitors as an advertisement which may ultimately increase the manufacturer's sales. The first of these modern exhibitions is believed to have been held in Paris in 1798, in the Maison d'Orsay, and included only articles of local manufacture. This exhibition, as well as another held in Paris during the same year, was so successful that Napoleon inaugurated a third exhibition in 1802, and this in turn led to the establishment of similar triennial exhibitions. The Royal Dublin Society began its series of triennial exhibitions in Dublin in 1829. At first only specimens of native industry were shown, but afterward products of foreign manufacture were shown as well. These proved popular, and subsequently exhibitions were held periodically in other cities of the United Kingdom, notably in Birmingham, Liverpool, and Manchester. It was but natural that such exhibitions should extend to the United States, and the American Institute (q.v.) of New York, founded in 1828, had among its objects the holding of annual fairs at which inventors and manufacturers might exhibit their productions. The Franklin Institute of Philadelphia, founded in 1824, is of a similar character, and has from time to time had various expositions, chiefly devoted to the presentation of scientific developments. Also of a somewhat similar nature is the St. Louis Exposition, which was organized in 1883 and during each year since its inception has held an exhibition of industrial products, accompanied frequently by a display of fine arts. The fairs of the Mechanics' Institutes were a natural development of such institutions and prevailed locally for many years; but with the establishment of museums and libraries, which in recent years have combined under their management special exhibits organized for the occasion, the importance of the larger exhibitions has waned, especially in the United States. With the passing of these local exhibitions there have come in the United States expositions that have been sectional rather than national or local in character, and also commemorative of some historical event. Among these may be mentioned the World's Industrial Cotton Culturist Exposition, which was held in New Orleans, La., from Dec. 16, 1883, to June 30, 1884; the California Mid-Winter Exposition, held in San Francisco, from Jan. 1 to July 4, 1894. This was followed by the Cotton States and Industrial Exposition, which was held in Atlanta, Ga., from Sept. 15 to Dec. 31, 1895; the Tennessee Centennial Exposition (q.v.), held in Nashville, Tenn., from May 1 to Oct. 31, 1897; the Trans-Mississippi Exposition (q.v.), held in Omaha, Neb., from June 1 to Nov. 1, 1898; the Pan-American Exposition (q.v.), held in Buffalo, N. Y., from May 1 to Nov. 2, 1901; the South Carolina Interstate and West Indian Exposition (q.v.), held in Charleston, S. C., from Dec. 1, 1901, to June 1, 1902. The Lewis and Clark Centennial American Pacific Exposition and Oriental Fair (q.v.), held in Portland, Oregon, from June 1 to Oct. 15, 1905; the Jamestown Tercentennial Exposition (q.v.) held in Hampton Roads, Va., from April 26 to Nov. 30, 1907, and the Alaska-Yukon Pacific Exposition (see under SEATTLE), held in Seattle, Wash., from June 1 to Oct. 15, 1909. Of less importance have been the special expositions, such as the Chicago Railway Exhibition, held in Chicago, Ill., in 1882; the Cincinnati Industrial Exposition, held in Cincinnati, Ohio, in 1883; the Electrical Exhibition, held in Philadelphia, Pa., in 1884; the Marietta Centennial Exposition, held in Marietta, Ohio, in 1888; the Patent Centennial Celebration, held in Washington City in 1891; the National Export Exposition, held in Philadelphia, Pa., in 1899; and the Printing Exposition, held in New York City in 1900.

Among the expositions, many of which were international, that have been held in recent years and were devoted to some special subjects, may be mentioned the following: of articles connected with the leather industry, in Berlin in 1877; of all kinds of paper and pasteboard, in Berlin in 1878; of fisheries, in Berlin in 1880; of electrical appliances, in Paris in 1881; of geographical exhibits, in Venice in 1881; of cotton, in Atlanta, Ga., in 1881; of early data in American history, in Madrid in 1881; of fisheries, in London in 1883; of historical matters pertaining to Columbus and the discovery of America, in Madrid in 1882; of hygienic, chemical, pharmaceutical, and sanitary objects, in Naples in 1894; of German products and industries, in Berlin in 1896; of fisheries, in Bergen, Norway, in 1898; of maritime industries, in Bordeaux, France, in 1907.

The success of many of the earlier local expositions led to the inauguration of a series of expositions of international character. The first of these, which was announced in 1849, was held under the direction of the Society of Arts in London. The exhibition was opened on May 1, and continued until Oct. 15, 1851, during which time 6,039,195 persons visited it. The total number of exhibitors was 13,938, of whom 6556 were from foreign countries and the remainder from Great Britain and her colonies. The exposition was a financial success, the receipts from admission fees and subscriptions amounting to $2,444,718, while the expenses were nearly $1,600,000. The history of the exposition has been preserved in several works, and perhaps most fully in the 13 volumes of reports issued by the commissioners. Its success led the Royal Dublin Society to make its exhibition in 1853 an international one. The exposition was opened on May 12, 1853, and for the first time the display of paintings as a regular feature was introduced. The total number of visitors was about one million, but the exposition proved a failure, as the receipts were less than one-half of the expenditures.

During the same year an Exhibition of the Industry of All Nations was held in New York City. The site chosen was on Sixth Avenue between Fortieth and Forty-second streets, the place being now known as Bryant Park. The principal building was in the form of a Greek cross surmounted by a dome in the centre, and the triangular spaces between the arms of the cross were roofed over at the first story for the purpose of obtaining additional space. In the allotment of space one-fourth of the building was devoted to the exhibits of the United States, one-fourth to those of Great Britain and Ireland, one-fourth to Germany, France, and Belgium, and the remainder to the exhibits of other nations. The exposition was opened with appropriate exercises by President Pierce on July 14, 1853. The cost of the building and running expenses was raised by the issuing of stock to the amount of $500,000, but, notwithstanding the interest aroused, it was a financial failure.

The next exposition of importance was that held in Paris in 1855 and known as the Paris International Exposition. The site chosen was the Champs Elysées, where the main building, in the form of a parallelogram 827 feet long by 354 feet in width, was erected as a permanent structure to receive future expositions or to serve for great public ceremonies and for civil and military fêtes. In addition to the Palais de l'Industrie, as the main building was called, there were separate structures for the exhibition of the fine arts, agricultural implements and products, etc. This exposition began on May 15 and continued to Nov. 15, 1855, during which time the visitors numbered about four and one-half millions. The industrial and art exhibits shown on this occasion were considered superior to those of all previous international expositions. The expenses amounted to upward of $5,000,000, while the receipts were scarcely one-tenth of that amount.

Several minor expositions were held in Europe during the years that followed, notably in Edinburgh and Manchester in Great Britain, and in Munich in Bavaria; but the next international exhibition of importance was held in London in 1862. The site chosen was a tract of land in South Kensington, covering an area of about 24 acres, where a permanent structure was erected. About one-half of the space was allotted to the exhibits of the United Kingdom and its colonies, and the other half to foreign countries, and the total number of exhibitors was 28,653. The exhibition was opened on May 1, and closed on Nov. 1, 1862. The number of visitors is given as 6,211,103. The total cost and expenses of the exhibition amounted to nearly $5,000,000, but the receipts failed to reach that sum by a comparatively small amount.

Minor expositions, although of an international character, were held in Constantinople in 1863, in Dublin and in Oporto in 1865, and in Stockholm and Melbourne in 1866.

In 1864 it was decreed by Emperor Napoleon III that an international exposition should be held in Paris in 1867. A commission was appointed with Prince Jerome Napoleon as president, under whose direction the preliminary work was begun. The site chosen was the Champs de Mars, the great military parade ground of Paris, which covered an area of 119 acres and to which was added the island of Billancourt, of 52 acres. The principal building was rectangular in shape with rounded ends, having a length of 1608 feet and a width of 1247 feet, and in the centre was a pavilion surmounted by a dome and surrounded by a garden, 545 feet long and 184 feet wide, with a gallery built completely around it. In this building were seven concentric galleries, the central space in each of which was allotted to the exhibits of a country, while radial avenues extended from the garden, separating the sections of the several nations from each other. This arrangement was adopted so as to display similar goods from different nations in such a manner that they could be readily compared and studied. In addition to the main building there were nearly 100 smaller structures on the grounds. There were 50,226 exhibitors, of whom 15,055 were from France and her colonies, 6176 from Great Britain and Ireland, and 703 from the United States. The funds for the construction and maintenance of the exposition consisted of grants of $1,165,020 from the French government, a like amount from the city of Paris, $1,553,360 as a guarantee fund, and about $2,000,000 from public subscription, making a total of $5,883,400; while the receipts were estimated to have been but $2,822,900, thus leaving a deficit, which, however, was offset by the subscriptions from the government and the city of Paris, so that the final report was made to show a gain. The exhibits were examined by a jury which included some 600 experts, among whom were many of the foremost scientific men of the world. The exposition was formally opened on April 1, and closed on Oct. 31, 1867, and was visited by 9,238,967 persons, including exhibitors and employees. This exposition was the greatest up to its time of all international expositions, both with respect to its extent and to the scope of its plan.

After minor expositions held in Havre in 1868, Amsterdam in 1869, Sydney in 1870, and Moscow in 1872, the next great international exposition was that held in Vienna in 1873. Preliminary announcements were issued by the Austrian government in 1871, and a commission, of which Archduke Charles Louis was protector and Baron de Schwartz Senborn chief manager, was charged with its inauguration. Accordingly a site on the Prater was chosen, covering 280 acres, where an Industrial Palace consisting of a central nave 2953 feet long, 83 feet, 8 inches wide, and 73 feet, 10 inches high, of six intersecting transepts each 572 feet, 6 inches long, 51 feet, 1 inch wide, and 41 feet high, and of a great rotunda, the largest in the world, of 354 feet diameter at the middle of the nave, was built. Other important buildings were a Machinery Hall, an Art Building, and Agricultural Halls, and also a large number of smaller special buildings. There were 55,492 exhibitors, whose exhibits were classified into 26 groups, and were duly examined by an international jury of awards, who distributed diplomas of honor and medals for progress, merit, good taste, fine arts, and for coöperators. There were 643 exhibits shown by the United States, for which 349 awards were made as well as 26 medals for good taste and coöperation, making a total of 375. The cost of the buildings and running expenses was nearly $10,000,000, while the receipts were about $2,000,000, leaving a deficit of nearly $8,000,000, which was made up by government appropriation. The total number of visitors was 7,254,687. At this exposition was inaugurated the custom of gathering together men interested in various specialties, whose meetings took the form of congresses. Among these were the International Patent Congress, the International Congress for National Economy, that for Complex Instruction, Linen Industries, etc. The exposition was opened with appropriate ceremonies on May 1, and closed on Oct. 31, 1873.

The importance and value of international expositions shown by those held abroad led to a determination on the part of the United States to celebrate the centennial of the independence of the United States by an international exposition to be held in Philadelphia in 1876, a description of which forms the subject of a special article under the title of CENTENNIAL EXPOSITION, INTERNATIONAL (q.v.).

The French government, desirous of showing to the world the assured success of the Republic, and incidentally to recommend the French system of industrial protection, determined to hold a universal exposition in Paris in 1878, and an invitation was issued by President MacMahon inviting all nations to participate. The site selected was the Champs de Mars, as in the exposition of 1867, to which was added an elevated plateau on the opposite side of the Seine, known as the Trocadéro, and connected by the historical bridge of Jena. The main building, of iron and glass, was rectangular in form and covered 27,900 square yards. The art galleries and the buildings erected for the special exhibits made by the authorities of the city of Paris occupied a court in the centre of the building. The Palace of the Trocadéro was of stone and remained as a permanent memorial of the exposition. In addition there were numerous smaller structures in which special exhibits were shown, and the various buildings of foreign governments. The cost of the exposition was over $6,000,000, which sum was raised by grants from the French government and the city of Paris, but the receipts were only about $2,000,000. The total number of exhibitors was about 52,835, which was less than in Vienna, and was explained by the fact that several governments, including Germany, refused to participate in the exposition. The exhibits were viewed by an international jury who distributed among the exhibitors from the United States 10 grand prizes, 7 special prizes, 143 gold medals, 224 silver medals, 277 bronze medals, and 208 honorable mentions. International congresses were held continuously throughout the exposition, and in all some 30 were convened at which representatives from foreign governments were present and discussed the subjects under consideration. The exposition was formally opened on May 1, and continued until Oct. 31, 1878. The total number of admissions to the exposition was 16,159,719.

Among the minor expositions that followed the Paris Exposition may be mentioned those held in Amsterdam in 1883, Calcutta in 1884, Antwerp in 1885, Edinburgh in 1886, and Melbourne in 1888.

It had become a custom for the French government to hold an exposition every 11 years, and accordingly invitations were issued to foreign governments to attend a universal exposition to be held in Paris in 1889, ostensibly to celebrate the centenary of French independence. The grounds selected for the exposition were the Champs de Mars, 128 acres; the Trocadéro Garden, 42 acres; the Esplanade des Invalides, 38 acres; and the Quai d'Orsay from the Champs de Mars to the Ministry of Foreign Affairs, 20 acres, making a total of 228 acres. The principal building was the Palace of Industries, which was a large parallelogram flanked by two wings and covering 1,138,930 square feet. It was surmounted by a central dome 195 feet high and having an exterior diameter of 120 feet. Beyond this were the twin palaces of the Fine and Liberal Arts, each of which covered 202,232 square feet and was surmounted by a cupola 183 feet high. Numerous other smaller structures were on the grounds, including those of various governments. The important architectural feature of the exposition, however, was the famous Eiffel Tower (q.v.), 984 feet high, which remained as a memorial. The total number of exhibitors was over 61,722, whose displays were examined by a jury of awards who recommended 33,139 awards. More than 70 international congresses convened during the exposition, and delegates from various governments were appointed to discuss the subjects that were brought before them. The exposition was opened on May 6, and closed Nov. 6, 1889, and was visited by 25,121,975 persons.

No expositions of importance took place in the years that followed until 1893, when the four hundredth anniversary of the discovery of America was celebrated in the United States by the World's Columbian Exposition (q.v.), held in Chicago, Ill.

Subsequent to the World's Fair held in Chicago, many of the exhibits shown there were taken to San Francisco, and an exhibition known as the California Mid-Winter Exhibition was held during 1894, and this was followed in the United States by a series of commemorative expositions, a list of which is given elsewhere in this article. Likewise there were several minor expositions abroad, of which perhaps the most important was that held in Brussels in 1898, at which commissioners representing the United States were present.

The proposition of holding a World's Fair in Paris in 1900 began to take shape as early as 1892. The location chosen was that similar to the previous expositions, and included the Champs de Mars and the Trocadéro Garden, the Esplanade of the Invalides, together with narrow strips on each bank of the Seine, connecting on the south side the Esplanade of the Invalides with the Champs de Mars, and on the north side connecting the park of the Art Palaces with the Trocadéro, making in all an area of 336 acres, also with an annex in the Bois de Vincennes devoted to exhibits of transportation and sports. Across the river on the Esplanade of the Champs de Mars were the special buildings devoted to the exhibition of science and art, education, engineering, and means of transportation, mechanical industries, agriculture and food, chemistry, mechanical appliances, textile industries, mining and metallurgy, etc.; while those along the south bank of the Seine were the buildings of the naval and military exhibits, followed by the structures erected by the various nations, until the Esplanade des Invalides was reached, where were the palaces of foreign industry and decorative art. For the erection of these various buildings and running expenses of the exposition a fund amounting to upward of $27,000,000 was raised, part of which was contributed by the national government, by the municipality of Paris, and part by the issuing of bonds, each of which had a face value of 20 francs, and consisted of 20 admission tickets with numbers for various lottery drawings, and also by a sum of money advanced by the Bank of France. Exhibits were classified into 18 groups, the subdivisions into 121 classes. The official catalogue gave 79,712 exhibits, of which 31,946 were from France and 6674 from the United States. An international jury of awards examined the exhibits, recommending 42,790 awards. The usual series of international congresses were held, and announcements for over 125 were made. The exhibition was opened on April 14, and continued until Nov. 11, 1900, during which time it was visited by more than 50,000,000 persons, and, on Sept. 6, 600,528 were reported to have passed through the gates, which was the largest attendance for any single day. A financial statement issued at the close of the fair showed a deficit of about $400,000, so that the exposition may be considered to have been a financial success, especially when it is remembered that the value of the permanent buildings was very much greater than the deficit.

This summary of the history of world's fairs may properly be closed with the mention of the exposition held in St. Louis in 1904, known as the Louisiana Purchase Exposition (q.v.), in celebration of the centennial anniversary of the purchase of the Territory of Louisiana from France; to be followed by the Panama Pacific International Exposition (q.v.), held in San Francisco, Cal., from Feb. 20 to Dec. 4, 1915.

Among the recent minor expositions abroad were the following; Liége, Belgium, 1905; Quito, Ecuador (celebrating the centenary of independence), 1909; Brussels, Belgium, 1910; Buenos Aires, Argentina (celebrating the centenary of independence), 1910; Turin, Italy (celebrating the semicentenary of proclamation of independence of Kingdom of Italy), 1911; and Ghent, Belgium, 1913.

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EX'ILE. See BABYLONISH CAPTIVITY.

EXILE. Expulsion from one's native country by government authority for a period or for life; also, residence abroad in a foreign land either under compulsion by law, or voluntarily to avoid some form of punishment, exposure to which would follow continued residence in the native land. Exile in the first sense (expulsion) may be either simple exclusion upon pain of death or some lesser penalty, or may take the form of transportation to some foreign or secluded land to which the exiled person is confined.

Among the Greeks exile was the legal punishment for homicide, murder of an alien, instigation to murder, and malicious wounding; but it did not originally exist among the Romans, although the interdiction of fire and water practically amounted to the same thing. As a political measure, expulsion from the country was resorted to in Greece, and it might involve loss of the rights of citizenship and the forfeiture of property, except in cases of ostracism (q.v.).

At Rome the interdiction of fire and water (*interdictio aquæ et ignis*) was the penalty for such serious crimes as treason, arson, and poisoning; and the accused was at liberty to anticipate an unfavorable result of a trial by going into voluntary exile. This voluntary exile did not arise as a substitute for punishment at home, but from the fact that the interdict was a survival of a ruder form of justice in which the state merely outlawed the criminal and left him to the private vengeance of the injured parties, which he escaped by fleeing to the protection of foreign lands whither the state had no reason to pursue him. Loss of civic rights, therefore, did not follow voluntary exile unless the exile was declared to be deserved, or the interdiction was subsequently pronounced, or the refugee became a citizen of a foreign state. Confiscation of property took place only in extreme cases. Sometimes the interdict was pronounced for political purposes, as in the case of Cicero. Originally it was pronounced by the Comitia Centuriata, and later by the judicial commissions appointed to try offenses.

Direct expulsion was first practiced under the Empire under the names of *deportatio* and *relegatio*. *Deportatio* was a form of banishment to a specified locality (usually an island), involving loss of civic rights and usually forfeiture of property; *relegatio* was a milder form which did not affect the rights of the man as a citizen. Among modern nations exile survives as a punishment in the form of transportation to penal colonies or settlements, as in the case of the former penal colonies of Australia and Tasmania (Van Dieman's Land) of Great Britain, and the Siberian colonies of Russia (see AUSTRALIA; TASMANIA; SIBERIA); but with the increase of civilization this form of punishment is being abandoned.

The right of an alien to demand and receive protection for his person and property in the country where he resides has always received general recognition among civilized nations, and aliens who are refugees from punishment for political crimes or *mala prohibita* and not *mala in se* are not among the classes included in the treaties for extradition now commonly existing between civilized nations. This protection, however, is territorial only and extends solely to those aliens within the boundary of the state, unlike the protection to citizens which the state affords at all times and places. Such a refugee is amenable to the laws of the country where he resides, and may there be punished for any acts there committed by him which are crimes by the law of that land; but the fact that he is an accomplice in plots against his native country with others there is rarely considered a reason for surrendering him upon demand, except when the demand is made by a superior power which will not brook a refusal. For further information, consult such related articles as ALIEN; EXTRADITION; PUNISHMENT; BANISHMENT; TRANSPORTATION, PENAL; and consult the authorities referred to under ALIEN; EXTRADITION; PUNISHMENT; INTERNATIONAL LAW; ETC.

EX'INE (from Lat. *ex*, out). In plants, the outer one of the two layers of a spore wall, the inner one being called the intine. The exine is the protective layer, being comparatively thick and impervious and often developing a rough surface or appendages of various kinds. It is often called the exospore. See SPORE.

EX'MOOR. A former forest, but now a moorland region, 30 square miles in area, in the west of Somersetshire and northeast of Devonshire (Map: England, C 5). It consists of dark ranges of hills, deep wooded glens, and lonely valleys. Its highest point is Dunkery Beacon, 1707 feet above sea level. It is the sole remaining habitat of the wild red deer of England and is known for distinctive breeds of sheep and ponies. It has iron and copper mines and is graphically and romantically described in Blackmore's *Lorna Doone*.

EXMOUTH, ĕks′mŭth (AS. *Exan mūþa,* mouth of the Exe). A seaport, market town, and watering place of Devonshire, England, on the English Channel, at the mouth of the Exe, 10 miles southeast of Exeter (Map: England, C 6). It is picturesquely situated on a hill rising from the sandy estuary of the Exe and is noted for its mild climate. The Woodbury hills, 800 feet high, protect it from the east winds. It is an attractive little town, with a good beach for bathing, a fine sea wall, handsome terràces and promenades, assembly rooms, libraries, and the usual features of a watering place. New docks were opened in 1869. Its chief industries are lace making and fisheries. Pop., 1901, 10,485; 1911, 11,963. The town is of considerable antiquity. Here Sweyn the Dane landed in 1003. It was taken by the Royalists in 1646.

EXMOUTH, Edward Pellew, Viscount (1757–1833). An English admiral. He was born at Dover, of a Cornish family. He was educated at the Truro Grammar School and entered the navy at 13 years of age. When only 19, he showed conspicuous gallantry, after his superior officers had been severely wounded, by saving his vessel, in the battle of Lake Champlain, Oct. 11, 1776. In command of a naval brigade he took part in Burgoyne's campaign in the following year. In 1782 he attained the rank of post captain, and in 1793 he captured the *Cléopatre,* a French frigate. For this victory he was knighted. In 1799, in command of the *Impétueux,* he harassed the French coast and won several brilliant actions. In the same year his personal influence and bravery quelled the mutiny in Bantry Bay and saved the British fleet to the country. In 1804 Sir Edward Pellew was advanced to the rank of rear admiral, and in 1814 was created Baron Exmouth of Canonteign, Devonshire. In 1816 he went to Algiers with a fleet of 16 vessels to enforce the abolition of Christian slavery and the liberation of all Christian slaves. Three thousand Christians, mostly Spaniards and Italians, were freed and conveyed to their respective countries. Exmouth received the thanks of Parliament on his return to England and was promoted to the rank of Viscount. In 1821 he retired from public service, but shortly before his death, Jan. 23, 1833, he was honored with the rank of vice admiral of England. Consult Osler, *Life of Admiral Viscount Exmouth* (London, 1844); and Mahan, *Types of Naval Officers* (Boston, 1891).

EX′NER, Karl (1842–). An Austrian physicist. He was born at Prague and was educated at Vienna and Zurich. In 1885 he became president of the Chemico-Physical Society in Vienna and in 1892 was appointed lecturer at the University of Innsbruck. From 1894 to 1904 he was professor of mathematical physics at that university. In the latter year he retired, though he continued to live at Innsbruck and to retain his interest in physics and meteorology. His publications include: *Ueber die Frauenhoferschen Ringe* (1877); *Ueber das Funkeln der Sterne* (1881); *Ueber Beugungserscheinungen* (1885); *Ueber die polarisierende Wirkung der Lichtbeugung* (1890–92); *Genesis der Erklärung des Scintillation* (1901).

EXNER, Siegmund (1846–). An Austrian physiologist. He was born at Vienna and after studying there and at Heidelberg lectured at Vienna University, where in 1875 he became professor of physiology, and where in 1891 he was made a member of the board of directors of the Physiological Institute. He made numerous investigations on the physiology of the nervous system and twice received the prize awarded by the Vienna Academy of Sciences for original researches. His publications include: *Leitfaden bei der mikroskopischen Untersuchung tierischer Gewebe* (2d ed., 1878); *Untersuchungen über die Lokalisation der Funktionen in der Grosshirnrinde des Menschen* (1881); *Die Innervation des Kehlkopfes* (1884); *Die Physiologie der facettierten Augen von Krebsen und Insekten* (1891); *Entwurf zu einer physiologischen Erklärung der psychischen Erscheinungen* (1894). In 1887 he became coeditor with Gad of the *Centralblatt für Physiologie.*

EXNER, Wilhelm Franz (1840–). An Austrian technologist, born at Gänserndorf and educated at the Polytechnic Institute of Vienna. In 1874 he was appointed inspector of industrial schools in the Ministry of Commerce. With Banhans and others he founded in 1879 the Industrial Museum at Vienna and became its director. He was elected to the Austrian Chamber of Deputies in 1882, 1885, and 1891. His works include: *Das moderne Transportwesen im Dienste der Land- und Forstwirtschaft* (2d ed., 1880); *Werkzeuge und Maschinen zur Holzbearbeitung* (1878–83); *Die Hausindustrie Oesterreichs* (1890); *Das K. K. Technologische Gewerbe-Museum in Wien im ersten vierteljahrhundert seines Beistandes* (1904).

EXOAS′CUS. A genus of parasitic fungi causing various kinds of deformities on seed plants, especially trees. One of the species causes the disease known as peach curl, which results in a characteristic crinkling and deformity of the leaf. Another species forms the so-called plum pockets, in which the young plums become of abnormal size and shrivel. Other species form brushlike deformities on certain trees, known as witch brooms.

EX′ODUS (Lat., from Gk. ἔξοδος, *exodos,* way out, from ἐξ, *ex,* out + ὁδός, *hodos,* way). The Latin name of the second book of the Pentateuch, so called from the fact that it treats of the deliverance of the Hebrews from Egypt. It contains, however, much more than this. Taking up the narrative with the death of Joseph, where Genesis left off, it recounts the oppression of the Hebrews by their Egyptian taskmasters; the birth, youth, and call of Moses (chaps. i–vi); the plagues and the deliverance from Egypt (vii–xv); the way to Sinai and the establishment of the Covenant with Yahwe, incidental to which a series of laws is set forth (xvi–xxiv); directions for the construction of the tabernacle (xxv–xxxi); the sin of the golden calf (xxxii–xxxiv); the making of the tabernacle and its furniture, and the setting up of the edifice (xxxv–xl).

It will thus be seen that Exodus is a mixture of historical narrative with legislative material. The legal sections are (1) Ex. xx. 23–xxiii. 19, known as the Book of the Covenant; (2) the Decalogue, Ex. xx. 1–17; and (3) an older Decalogue, Ex. xxxiv. 10–28. (See Decalogue.) In the opinion of many scholars these legal sections date from different periods, while the historical sections also come from different sources, and there are many interpolations, notably in chaps. xxxv–xl. (See Pentateuch.) As to the historical character of the exodus from Egypt, the legislation at Sinai, and the tabernacle, there is much difference of opinion among scholars. Some maintain that Israel as a whole, or at least the Joseph tribes, once lived in Egypt and escaped from bondage across some northern projection of the Gulf of Suez, while others regard the Egyptian setting as secondary and think of a successful crossing of the Gulf of Akabah (q.v.); some hold that the Decalogue in Exodus xx. 1-17 and the Book of the Covenant were promulgated by Moses at Sinai, whether this mountain be looked for east or west of the Aelanitic Gulf (see SINAI), while others consider these laws as of Palestinian origin; and though the description of the tabernacle is widely recognized as idealized, there are those who assign some such structure to the nomadic period, while others see in it only a reflection of Solomon's temple projected into the past. Consult the commentaries on Exodus, particularly those of Dillmann (Leipzig, 1880), Ryssel (ib., 1897), Bäntsch (Göttingen, 1900), Holzinger (ib., 1900); Bennett (Oxford, 1908), McNeile (New York, 1908), Driver (ib., 1911); Popper, *Der biblische Bericht über die Stiftshütte* (Leipzig, 1862); Bacon, *The Triple Tradition of Exodus* (Hartford, 1894); Eduard Meyer, *Die Israeliten und ihre Nachbarstämme* (Halle, 1906); Gressmann, *Mose und seine Zeit* (1913).

EXOG'AMY. Marriage outside of a group; i.e., the system of permitting marriages only between members not belonging to the same group. The term is correlative with endogamy (q.v.). Etymologically it would be justifiable to identify exogamy with the rules preventing incest, and in this wide sense of the term probably every tribe in the world might be reckoned as exogamous, since some sort of restrictions of marriage seems to occur everywhere, though the character of the incest group differs widely. More particularly, however, modern usage restricts the term to definite social units of the character of moieties, clans, gentes, the Australian classes, etc., though local exogamy likewise occurs.

The speculations of Lewis H. Morgan have had great influence on the study of exogamy. He held that there was a period in human history when brothers and sisters intermarried. At a certain stage, practically universal except in Polynesia, this was precluded by organizing into a one-sided kinship group those connected by descent from the same female through females and prohibiting marriage within this group (clan). The same result might have been achieved by a corresponding patrilineal group (gens); but, according to Morgan, this could develop only at a later stage, when fatherhood had become less uncertain than in the primitive conditions of sexual license upon which he assumes the exogamous scheme to have been imposed. Morgan's theory presupposes the practical absence of marriage restrictions prior to the institution of clan exogamy. It has been discovered, however, that such restrictions, based on blood kinship, not only coexist with clan or gentile marriage prohibitions, but exist in the absence of clan or gentile systems, which are lacking in North America precisely among the most primitive tribes. In other continents somewhat similar results have been obtained; thus, among some of the most primitive tribes of New Guinea there are no exogamous clans or gentes, yet there are incest prohibitions based on blood relationship. In short, incest regulations are universal, clan or gentile exogamy is not. Moreover, clan or gentile exogamy may be a secondary result of relationship restrictions, as seems to be the case among the Blackfoot and Todas, where the prohibitions applying to blood relatives exclude ipso facto all fellow gentiles. Illustrations of this type make it next to impossible to give a single psychological explanation of exogamy. Indeed, even to-day the psychological nature of the exogamous clan or gentile rule is by no means uniform. In Australia and northwestern America, e.g., it appears to approach in rigor our own incest feelings; but among other tribes, such as the Blackfoot or Crow Indians, transgressions are resented rather as breaches of etiquette, and there is no proof of any earlier sentiment akin to that of the above-mentioned tribes. It will therefore hereafter be necessary to seek for specific causes of exogamy in every area studied, though common factors may be determined as the result of such an inquiry. More particularly the notion that members of a totem group practice exogamy because of their descent from the putative totem ancester must be considered untenable. Totemism and exogamy frequently coexist, but very often they do not; and in many instances the totemic exogamy found is derivative, i.e., is a corollary of the exogamous rule attached to a larger nontotemic division.

Westermarck has suggested, as a cause of incest regulations, a hypothetical instinct against mating existing between those who are brought up together in close familiarity. This suggestion has been accepted by some other scholars, but is not by any means established. Even less satisfactory is the theory that primitive men consciously sought to check the harm due to marriages of near kin; for it is not only doubtful whether such marriages are really harmful, but the theory assumes a degree of rationalizing activity that is quite inadmissible in primitive conditions.

Since exogamy is bound up with various other ethnological phenomena, the literature bearing on it is immense. The following list, therefore, comprises only some of the most helpful general treatises: Morgan, *Ancient Society* (New York, 1877); Lang, *Social Origins* (London, 1903); Thomas, *Kinship Organizations and Group Marriage in Australia* (Cambridge, 1906); Frazer, *Totemism and Exogamy* (London, 1910); Goldenweiser, "Totemism: An Analytical Study," *Journal of American Folk-Lore*, pp. 179-293 (1910); Cunow, *Zur Urgeschichte der Ehe und der Familie* (Stuttgart, 1912).

EX'OGEN (from Gk. *ἔξω*, *exō*, outside + *-γενής*, *-genes*, producing, from *γίγνεσθαι*, *gignesthai*, to become). An obsolete term, formerly applied to dicotyledons. See DICOTYLEDON.

EX'OGY'RA (Neo-Lat. nom. pl., from Gk. *ἔξω*, *exō*, outside + *γῦρος*, *gyros*, circle). A genus of fossil pelecypods of the oyster family (Ostreidæ), found in the rocks of Upper Jurassic and Cretaceous age. The shells are inequilateral, with only one muscle, and they resemble somewhat the form of the young plicate shells of the modern edible oyster, though they are larger and more convex, and the beaks of their valves are spiral. The left or larger valve is deeply convex, often fixed by its apex, and is usually strongly ornamented by radial folds of the surface, and sometimes also by imbricating plates. The right valve is flat or concave and operculum-like, with a surface that is either smooth or marked by faint radiating lines. *Exogyra costata* of Say, with a length of 3 to 8 inches, is very abundant in certain beds of the Cretaceous system of the Atlantic and Gulf coastal plain. See Oyster.

EXON'ERA'TION (Lat. *exoneratio*, from *exonerare*, to unload, from *ex*, out + *onerare*, to load, from *onus*, load). In its broadest sense, the act of discharging or the state of being discharged from some liability or obligation. A person who has become bail for another may entitle himself to exoneration by surrendering his principal. At common law the devisee of lands which were subject to a mortgage given by his devisor, or the heir of such person upon inheriting the lands, was entitled to have the land exonerated from the mortgage debt—i.e., to have that debt paid out of the personal estate of the mortgagor. This rule has been changed in England and in many of our States by statute. At present the term is most frequently applied to the right of a surety to call upon the principal debtor to pay the guaranteed debt and thus relieve the surety from his liability thereupon. This right accrues as soon as the surety is put in danger of being compelled to pay his principal's debt. If the creditor will not proceed against the principal, the surety may file his bill in equity for the purpose of compelling the principal to satisfy the debt, it being unreasonable that a surety should always have such a cloud hanging over him. Consult: Williams, *Principles of the Law of Real Property* (22d ed., Toronto, 1914); Redfield, *Law and Practice of Surrogate's Courts* (7th ed., New York, 1910); De Colyar, *Treatise on the Law of Guarantees and of Principal and Surety* (London, 1900).

EX'OPHTHAL'MIC GOITRE, goi'tĕr. See Basedow's Disease.

EX'ORCISM (Lat. *exorcismus*, from Gk. *ἐξορκισμός*, *exorkismos*, exorcism, from *ἐξορκίζειν*, *exorkizein*, to administer an oath, from *ἐξ*, *ex*, out + *ὁρκίζειν*, *horkizein*, *ὁρκοῦν*, *horkoun*, to administer an oath, from *ὅρκος*, *horkos*, oath). The act of conjuring evil spirits, in the name of God, to depart out of the person possessed. It has been practiced in many religions and was especially common in ancient Babylonia. In the first Christian century it was a common custom of both Gentiles and Jews. The first Christians adjured evil spirits in the name of Jesus Christ; but as the opinion was entertained that all idolaters belonged to the kingdom of Satan, it was customary to exorcise heathens previous to their receiving Christian baptism; and since, on the theory of original sin, all infants were regarded as belonging to Satan's kingdom, exorcism became general at the baptism even of Christian children.

Of its exercise in the early Church, both in relation to energumens (q.v.), or persons possessed, and in the administration of baptism, there are numerous examples. The rite of exorcism is used by the Catholic church in three different cases: in the case of actual or supposed demoniacal possession, in the administration of baptism, and in the blessing of the chrism or holy oil, and of holy water, with the view of withdrawing from the power of Satan creatures which are to be used in the service of God. Its use in cases of possession is now extremely rare and in many dioceses is prohibited unless with the special permission of the bishop. In baptism it precedes the ceremony of applying the water with the baptismal form. It is used equally in infant and in adult baptism, and Roman Catholic writers appeal to the earliest examples of the administration of the sacrament as evidence of the use of exorcism in both alike. The rite of baptismal exorcism in the Roman Catholic church follows closely the scriptural model in Mark viii. 33. The exorcisms in the blessing of the oil and water resemble very closely the baptismal form, but are more diffuse. See Demoniac.

EX'ORCIST. A title of the second of the minor orders of the Roman Catholic church. Down to the middle of the third century the power of exorcism (q.v.) was exercised by Christians generally, without special authorization. Pope Fabian (236–251) seems to have been the first to assign a definite name and functions to exorcists as a separate order. The Fourth Council of Carthage (398) prescribed a rite of ordination for exorcists. The ceremonics of exorcism may be performed by any priest, since he is ordained exorcist on his way to the priesthood; but in many dioceses he must obtain special permission of the bishop. See Orders, Holy.

EX'OSTEM'MA (Neo-Lat., from Gk. *ἔξω*, *exō*, outside + *στέμμα*, *stemma*, garland). A genus of American trees and shrubs of the family Rubiaceæ, nearly allied to *Cinchona*. Several species yield febrifugal barks, which, however, do not contain the cinchona alkaloids. The most valued of these are Caribbee bark, Jamaica bark, and St. Lucia bark, the latter of which is the produce of *Exostemma floribundum*, a native of the more mountainous parts of the West Indies.

EX'OSTO'SIS (Neo-Lat., from Gk. *ἐξ*, *ex*, out + *ὀστέον*, *osteon*, bone). A bony tumor or excrescence growing from some of the osseous structures of the body. See Tumor.

EX'OTER'IC. See Esoteric.

EXPAN'SION. See Heat.

EXPANSION (as a political term). See Imperialism; United States, Extension of the Territory of the.

EX PAR'TE (Lat., from a part). From or on behalf of a designated party. The term is frequently used in the title of a legal proceeding. For example, if Shand is adjudged bankrupt the title of the bankruptcy proceedings is *In re Shand;* and if a creditor named Corbett makes an application in the cause for an order or determination in his behalf, his proceeding is entitled, *Ex parte Corbett in re Shand.* So, if Smith applies for leave to sue an official bond or for some particular writ (q.v.), this preliminary proceeding is entitled *Ex parte Smith.* The term is also used to describe the application or proceeding itself. Statements made in a judicial proceeding under such circumstances that the opposite party has no opportunity to challenge their accuracy are often spoken of as *ex parte.*

EXPA'TRIA'TION (from ML. *expatriare*, to banish from one's country, from Lat. *ex*, out + *patria*, fatherland, from *pater*, father). Change of residence and allegiance from one's native or adopted land to another country and government, arising by voluntary act or by operation of law. It has been declared by the United States Congress to be "a natural and inherent right of all people, indispensable to the enjoyment of the rights of life, liberty, and pursuit of happiness." (*United States Revised Statutes*, 1999, 2000.) In the same statute Congress characterized every opinion, order, or decision which denied, restricted, impaired, or questioned the right of expatriation, as inconsistent with the fundamental principles of the Republic. These statutory declarations fairly represent the view now prevailing in this country. In the War of 1812 Great Britain denied the right of expatriation to her citizens, holding that they could not renounce their native allegiance and assume a new one without her consent. This doctrine was accepted by Chancellor Kent as in accord with the principles of the common law. It no longer obtains, however, either in this country or in Great Britain. In 1870 an Act of Parliament and a treaty with the United States committed the British government to an acceptance of the rule contended for by her opponent in the War of 1812. Under this statute and treaty any British subject who at any time may become naturalized in a foreign state shall be deemed to have ceased to be a British subject and shall be regarded as an alien. Provision is also made for a formal declaration of allegiance by a person who is a British subject according to British law, but a foreign subject according to foreign law. It is further declared that a British woman by marriage with a subject of a foreign state is expatriated, and that a minor child changes its nationality with the expatriation of its father or widowed mother, provided it resides abroad with such parent. Expatriation of American citizens is regulated by the Law of March 2, 1907. By this law an American citizen is held to have expatriated himself when he has been naturalized in any foreign state. When a naturalized citizen of the United States has resided for two years in the foreign state from which he came, or five years in any other foreign state, he is presumed to have ceased to be an American citizen. But no American citizen is allowed to expatriate himself in time of war.

An American woman who marries a foreigner takes the nationality of her husband. Upon the termination of the marital relation she may resume her American citizenship, if residing in the United States, by continuing to reside there; if residing abroad, by returning to reside in the United States, or by registering as an American citizen with an American consul within a year of the termination of the marital relation. A foreign woman who acquires American citizenship by marriage to an American retains her American citizenship upon the termination of the marital relation if she continues to reside in the United States. Consult the articles on ALIEN; LAW; NATURALIZATION; and the authorities referred to under those titles.

EXPECTATION (Lat. *expectatio*, from *expectare*, to expect, from *ex*, out + *spectare*, to behold, from *spicere*, to look). The term is usually defined as an anticipatory attention, and the expectant consciousness is said to be dominated by an anticipatory image of the expected event. Neither of these statements, however, is strictly true. Experiments have shown that there are two situations in which expectation may arise. 1. The experience begins with a perception; the observer, after the perception, awaits another perception that in the past has followed the first: e.g., when a step is heard at the door, one expects a ring. The "awaiting" of the second perception here constitutes the expectant attitude. In consciousness this attitude is characterized by strain and other organic sensations and by verbal ideas; either of these complexes may be predominant, and either of them may retire to the background. An image of the awaited perception may or may not be present; it is not essential, and usually it is absent. 2. In the second situation there comes into consciousness a perception which has not been wrought by experience into a definite series. In such a case one expects something, but does not know what; one hears a ring, and expects "somebody." Introspection shows, however, that the pattern of consciousness is the same as before; the situations are different, but the expectant attitudes aroused by them are qualitatively the same. The sensational elements are the conscious aspect of the perceptive determination; they are the vehicle of the meaning "so-and-so is going to happen." (See DETERMINATION.) They derive in part from the bodily attitude of attention: tense muscles, inhibited breathing, accommodation of the sense organs. The expectant consciousness can, nevertheless, hardly be termed attentive; the kinæsthetic sensations are, truly, at the focus, but are not focal in their own right; they are given rather as context, as meaning, than as independent processes. Functionally the expectant consciousness lacks definiteness and clearness because it exists not for itself but for a consciousness about to be: it is a preparatory, a transitional consciousness.

It is clear that a suitable direction of expectation is the *sine qua non* of a full apprehension or clear apperception of the awaited impression. Hence it is customary, in all forms of psychological experimentation, to give a signal (a spoken "Now!" or the stroke of an electric bell) to the observer, at such an interval before the presentation of stimulus that expectation may just have time to reach its maximum without passing over into fatigue. The time required, at least in the simpler departments of experimental work, amounts to 1.5 or 2 seconds. During this period the observer has an opportunity to concentrate himself upon the problem in hand, either in a general way, by banishing irrelevant ideas and thoughts, or, more specifically, by calling up a definite mental image of the coming stimulus. Suppose, e.g., that the two points of a pair of compasses are to be set down simultaneously upon the skin of the wrist, at a certain distance apart, and that the observer is to say whether he senses one or two pressures. On hearing the ready signal, he will (*a*) devote his attention exclusively to the wrist and purposely ignore any accidental stimulation of eye or ear; while (*b*), if he has had previous experience in the discrimination of two points upon the skin, he will represent to himself, in terms of pressure sensation or otherwise, the various forms that cutaneous duality may take.

Expectation, then, if rightly directed, is of essential service to the experimental psychologist. But predisposition may be a source of error, as well as a help, in laboratory work. Suppose that we wish to ascertain the least separation of the compass points that can evoke the introspective response "two pressures." We shall begin with a separation of the points at which only one pressure is perceived and gradually increase this separation, in successive trials, until the judgment "one" passes over into the judgment "two." We secure the observer's full attention, at each application of the instrument, by means of our ready signal. Since, however, we are making a series of tests, and the series is progressing in a known direction (from oneness towards twoness), the observer may easily become prejudiced; at each fresh step of the series he may think, "*This* time there must be two!" The judgment "two" will therefore come too soon; our result is vitiated by the error of expectation. In all such cases some method must be devised whereby this error may be eliminated. In the present instance we seek to eliminate it by reversing our series. We begin a second set of tests with a separation of the compass points that gives two clear pressures, and work down, step by step, until "two" passes over into "one." The "one" comes too soon, in this reversed series, as the "two" came too soon in the preceding series. By averaging the results of the two procedures, in a number of series, we may hope to rule out the expectation error.

Consult: Wundt, *Outlines of Psychology* (Eng. trans., Leipzig, 1907); Kulpe, *Outlines of Psychology* (Eng. trans., London, 1909); Titchener, *Experimental Psychology*, II, ii (New York, 1905); id., *Text-Book of Psychology* (ib., 1910). See Habit; Practice; Psychophysics.

EXPECTATION WEEK. A name sometimes given to the period between Ascension Day and Whitsunday, because during this time the Apostles continued praying in earnest expectation of the Comforter.

EXPEC'TORANT (from Lat. *expectorare*, to drive from the breast, from *ex*, out + *pectus*, breast). Any medicine given to carry off the secretions of the respiratory tract. (See Bronchus; Bronchitis.) The National Formulary gives the following list of expectorants: *Sedative*, antimon. et potas. tart. apomorphia, ipecac, potas. citras; *Stimulant*, ammonii carbonas, ammonii chloridum, benzoin, tolu, creosotum, eucalyptus, grindelia, guaiacol, pix liquida, scilla, senega, sanguinaria, terebenum. and terpini hydras.

EXPEC'TORA'TION. The act of spitting; also the *sputum*, which is the Latin name for the mucus or other secretion discharged from the air passages. The examination of expectoration is of the utmost value in the diagnosis of diseases of the chest. Often the nature of an ailment can be determined or the diagnosis confirmed by the examination of the expectoration. In simple bronchitis the sputum is frothy and colorless and floats on water. In chronic bronchitis it is generally yellowish or greenish, and, owing to an admixture of pus, it sinks in water. If the sputum be tinged with dark blood, pneumonia is suspected. In tuberculosis of the lungs bright blood may be coughed up, or mucus of a pink tint from the coloring matter of blood, or the sputum may be very abundant, viscid, or greenish. It may have an offensive odor in tuberculosis and is always so characterized in gangrene of the lung. But the diagnosis does not rest entirely on the appearance of the sputum or the examination of the chest. Methods of staining certain elements and the use of the microscope will decide upon the presence or absence of the tubercle bacillus; Pfeiffer's bacillus, of *la grippe;* the pneumococcus and the pneumobacillus, of pneumonia; streptococcus, of pus infection; or other bacilli, as well as elastic fibres from the lung. In certain cases expectoration of mucus is to be encouraged, and cough must not be checked. In all cases of known or suspected communicable disease, as influenza (*la grippe*), pneumonia, or tuberculosis, the sputum must be received in a vessel in which it is kept moist until destroyed by disinfectants or burned. Carpets, furniture, and bedding should be protected from expectoration in these cases of disease, and sheets, pillow cases, handkerchiefs, napkins, and night clothing should be frequently changed and dipped in boiling water before being washed.

EX PE'DE HER'CULEM (Lat. [know] Hercules from his foot). A modern Latin proverb, meaning that the whole can be tested by a part. The saying rests on a story told by Aulus Gellius (*Noctes Atticæ*, 1, 1) on the basis of a work by Plutarch, now lost, that Pythagoras determined the stature of Hercules as follows: Tradition said that the stadium at Olympia measured just 600 times the length of Hercules' foot. Since this stadium was larger than other stadia, which represented 600 times the length of a normal man's foot, it was easy to tell how much larger Hercules' foot was than the normal human foot, and then, on principles of symmetry and mathematics, to determine just how much larger Hercules was than ordinary men. The saying is paralleled by another modern Latin phrase, *Ex ungue leonem*, '[Judge] a lion by his claw.' Similar in spirit, too, is the famous expression of Æneas about Sinon, in Vergil, *Æneid*, ii, 65–66, *Ab uno disce omnes*, i.e., 'From one [treacherous Greek] know the whole Greek race.'

EXPE'RIENCE MEETING. A name applied to religious gatherings at which one or more of those present set forth their spiritual history and experiences. In the Methodist church class meetings are of this nature, and some denominations have stated covenant or conference meetings. The ordinary prayer meeting of a church sometimes takes this form.

EXPERIMENTAL PSYCHOLOGY. See Psychology, Experimental.

EX'PERT (Lat. *expertus*, skilled, p.p. of *experiri*, to test). One who is specially experienced in a particular subject matter of inquiry, as the result of the previous habit or practice or study. From the legal point of view the most important function of the expert is that of witness in litigated cases.

The earliest recorded appearance of the expert in English judicial tribunals was in the capacity of an adviser of the court. As early as 1353 we are told that, in an appeal of mayhem, the sheriff was ordered to summon skillful surgeons from London to inform the court whether the wound in question was mayhem or not. In the seventeenth century it became customary to call experts as helpers of the jury. When acting in this capacity, they were sworn and examined by counsel as witnesses. At the trial of the Suffolk witches, in 1665, Sir Thomas Browne, the physician and natural philosopher, testified, after examining the accused, that he was of the opinion that they were bewitched. From that time the medical expert has been an important figure in criminal trials. But expert testimony is not confined to members of the learned profession. It may be given by farmers, mechanics, brokers, lumbermen, physicians, clergymen, scientists, lawyers, or any person qualified by special training and knowledge to answer questions requiring such training and knowledge to answer them. (See Evidence.) When the case is before a court and jury, it is for the court to say whether the questions call for expert assistance, as well as whether a particular witness is justified to speak as an expert thereon. It is for the jury to determine the worth of an expert opinion, after it has been given. Such opinion (however famous or learned or experienced the one who utters it may be) is not binding upon the jury. It may be accepted as helpful, or it may be totally disregarded. At times the expert deposes to facts rather than opinions; as when a chemist explains the examination of an alleged blood stain, or of parts of a human body. When his opinion is called for, it is ordinarily based upon a hypothetical question—*i.e.*, a question which supposes the statements of fact contained in it to have been established by competent evidence. Assuming the facts to be as stated in the question, the expert is asked to tell the jury what, in his opinion, is the correct inference to be drawn from them. It will be observed, therefore, that he is not asked to invade the province of the jury and decide the general question at issue, but only to testify to the specific inference that should be drawn from particular facts.

Whether a person can be compelled to attend and testify as an expert for the fees of an ordinary witness is a question upon which the authorities are conflicting. In England and in many of our States it has been answered in the negative, either by judicial decision or by statute. This view is based upon two considerations: First, that to compel a person to attend as a witness merely because he is accomplished in a particular science, art, or profession, would subject the same individual to be called upon in every cause where his opinion would carry weight. Second, that a person's special knowledge and skill are property, which should be no more at the mercy of the public than the goods of the merchant or the crops of the farmer. On the other hand, the view is maintained that the law allows no excuse for withholding evidence, and that the expert witness, in the performance of his duty as a good citizen, should be compelled to testify where his evidence would be helpful to a court or jury, whether that evidence be based upon personal observation of some fact connected with the case or upon his accumulated knowledge and experience. It is generally agreed, however, that an expert cannot be required to make any special preparation or investigation for the opinion he is supposed to give, without extra compensation.

The usefulness of expert evidence, and the advisability of changing the present methods of procuring and presenting it, are also questions upon which widely different views are entertained. A recent writer upon this subject, a lawyer of high reputation and sound judgment, has declared that "few judges have a good word to say for expert testimony." Lord Campbell once told the House of Lords that expert witnesses "come with a bias on their minds to support the cause in which they are embarked, and hardly any weight should be given to their evidence." Quite recently a learned judge in New York City advised the jury "to put all the expert testimony out of their minds and pay no attention to it." This he did although a week had been consumed in taking the expert testimony, because "an equal number of doctors has testified directly opposite to each other, and all with equal positiveness." On the other hand, the present system has its strong advocates, and no radical change is to be expected in the near future, though there is a growing sentiment in favor of the employment of expert witnesses by the state. Consult: Rogers, *Law of Expert Testimony* (St. Louis, 1891); Lawson, *Law of Expert and Opinion Evidence* (2d ed., Chicago, 1900); Foster, "Expert Testimony, Prevalent Complaints, and Proposed Remedies" (11 *Harvard Law Review*, 169); Endlich, "Proposed Changes in the Law of Expert Testimony" (32 *American Law Review*, 851). See EVIDENCE.

EX'PIA'TION, DAY OF. See ATONEMENT, DAY OF.

EX'PLANA'TION (Lat. *explanatio*, from *explanare*, to explain, from *ex*, out + *planare*, to level, from *planus*, plain). In science, the giving of a complete description of some object or event. In certain cases this end is attained by the subsumption of the phenomenon to a general law, as when a physical fact is brought under one or other of the general laws of mechanics. The law in such instances is mathematically exact; it sums up in shorthand all the conditions under which the phenomenon in question appears; it sets the phenomenon in its right place within the causal nexus of the material universe. In fields of science that are less "exact" than physics, such as biology and psychology, explanation takes on a different form. The laws of these sciences are, for the most part, hypothetical generalizations, or supplementings of the facts more or less hypothetical in character, rather than shorthand formulæ derived from the facts themselves; so that subsumption to them, while it may help to confirm a theory or to classify an otherwise heterogeneous subject matter, does not constitute explanation. Nothing is more erroneous than the popular belief that a given fact is adequately explained when it is referred to a "principle" of heredity or of memory. Explanation consists rather in an accurate description of the fact as observed, together with a statement, as full as the circumstances permit, of the proximate conditions under which it appears. Thus, a fact of mind, a complex mental process, is explained when we have (1) analyzed it into its elements, sensation and affection, (2) formulated the laws of connection of these constituent processes, and (3) referred them to their proximate physical conditions in the cerebral cortex. To explain, *e.g.*, an impulse as a "manifestation of our active nature" or of a "faculty of will," or to account for the rise of an idea in consciousness by a "law of telepathy," is to interpret a fact, a scientific datum, which can be known, in terms of the less known and hypothetical. Misunderstandings of this sort have recently called forth emphatic protest from men of eminence in scientific inquiry. "The business of all science is the description of facts"; and when a scientific "theory" goes beyond the specification of the conditions under which the facts are observable, it ceases to be an aid to thought and becomes a positive hindrance. Consult: Külpe, *Outlines of Psychology* (Eng. trans., London, 1909); id., *Introduction to Philosophy* (Eng. trans., New York, 1901); Mach, *Contributions to the Analysis of the Sensations* (Eng. trans., Chicago, 1897); *Popular Scientific Lectures* (Eng. trans., ib., 1895); Titchener, *Text-Book of Psychology* (New York, 1910).

EXPLOITS' RIVER. A large river in Newfoundland, 160 miles long, rising in the southwest part of the island, which it almost bisects (Map: Newfoundland, E 4). It takes a northeasterly course through the extensive Red Indian Lake and flows into the Bay of Exploits on the northeast coast. The fertile but sparsely settled valley abounds with game, and the river with fish. It is navigable for 12 miles from its mouth by steamers, and small boats ascend within 50 miles of the southwest coast.

EXPLO'SION. Explosion is a sudden and violent increase in the volume of a substance, due to the rapid conversion of a solid or liquid to the gaseous state, or to the instantaneous combination of two or more gases accompanied by increase of volume. Explosion is more rapid than combustion and slower than detonation. See BALLISTICS.

EXPLO′SIVES (from Lat. *explosus*, p.p. of *explodere*, to explode, from *ex*, out + *plaudere*, to clap). Substances, either solid or liquid, which, under the influence of some disturbing agency, enter into a chemical reaction which results in the production of gases and the evolution of much heat.

History. Nothing definite is known about the origin of explosives, and it is contended by some that the invention of gunpowder was contemporaneous with the discovery of saltpetre. Greek fire, which is believed to have been a preparation of pitch, resin, saltpetre, and sulphur, was first used during the defense of Constantinople about 660, and it is reasonable to believe that gunpowder was a development of this mixture. Manuscripts are in existence showing the use of gunpowder among the Arabs prior to 1250, but its discovery is generally attributed to Roger Bacon, of Oxford, England, who mentioned it about 1270, and to Berthold Schwartz, of Freiburg, Germany, who described it in 1328. Its discovery has also been attributed to the Chinese, and a description of its use at the siege of Pian-king and Lo-yang in 1232 is contained in the Chinese Annals, and its invention has been ascribed to the Hindus in consequence of certain passages in Indian law books, but the authenticity of these Oriental descriptions is doubted by modern writers. In 1346 at the battle of Crécy use was made of cannon (see ARTILLERY; ORDNANCE) in which gunpowder was employed as a propellant, and its use increased with the subsequent development of firearms, though it remained practically the same until the last century. (See GUNPOWDER.) In 1845 Schönbein, of Basel, discovered the explosive nature of guncotton, and in 1847 Sobrero discovered nitroglycerin (q.v.). Alfred Nobel invented dynamite (q.v.) in 1866, and to him also is due the production in 1875 of blasting gelatin. The explosive character of nitrated hydrocarbons was indicated by Hermann Sprengel in 1873, and in 1887 it was still further developed by Eugene Turpin, while the now important smokeless powders should be credited to the inventive genius of Vieille, who was the first, in 1886, to produce a really successful military smokeless powder, though previous investigators had been active in this field and had achieved varying degrees of success. See SMOKELESS POWDER.

Classification. Explosives are mechanical mixtures or chemical compounds. The first consist of certain chemical substances intimately mixed by mechanical means, which at an elevated temperature react upon each other and pass into the gaseous state, causing the explosion. Typical of this class is gunpowder. Another example of this class is a mixture of finely divided charcoal and liquid air. A mixture of acetylene and ozone in the liquid state, if it were employed, would constitute one of the most powerful explosives of the same class. A typical example of the second class of explosives is nitroglycerin. Other examples of the second class are guncotton, trinitrotoluene, "T. N. T.," and mercury fulminate. The further subdivisions of the two classes of explosives include the following groups: nitrate mixtures, chlorate mixtures, perchlorate mixtures, nitro-substitution compounds, nitric esters, fulminates, amides, and amines, and triazotates. Another classification in which explosives are divided into "low" explosives and "high" rests on the method by which the explosion is initiated, low explosives being "fired" by ignition and high explosives by detonation. Official classification designates explosives acceptable to the United States as "permissible" and those acceptable in Great Britain as "permitted" explosives. See below.

Theory of Explosions. An explosion may be defined as a chemical reaction which is effected in an exceedingly short space of time with the evolution of a large quantity of gas at a high temperature and accompanied by a shock. When this reaction occurs in a body which is confined, the expansive action of the heated gases produces disruptive effects. The force which is developed by the passage from the solid form to the gaseous condition depends upon the ingredients of the explosive and the way in which the explosion is initiated. When the explosion is progressive, i.e., starts at an initial point and continues from one group of particles to the next, and so on through the explosive, the action is termed *burning* and is analogous to ordinary combustion. When, however, the combustion is effected nearly simultaneously throughout the mass in an extremely short space of time, the action is called *detonation*. The development of a detonation may often be explained as resulting from the transformation of a shock into heat. This may be accomplished by the propagation of the shock from particle to particle in an explosive, or by a shock from one explosive body to another not in direct contact. The latter is the synchronous vibratory theory of Sir Frederick A. Abel, who claims that the originating cause of the detonation of an explosive lies in the synchronism between the vibrations produced by the body that provokes the detonation and those that the first body would produce in detonation, just as the string of a musical instrument resounds at a distance in unison with another vibrating cord. Marcellin P. E. Berthelot, on the other hand, contends that an explosion is due to the transformation of mechanical energy into heat, which during the explosion is again transformed into mechanical energy; i.e., it is dependent upon the production of two orders of waves, one series of which represents the explosive waves developed in the midst of the matter that detonates, and consists of a continually reproduced transformation of the chemical actions into thermal and mechanical actions which transmit equally the sudden pressure all around the centre of the concussion to the adjoining bodies and thence to a new mass of explosive material. Most explosives consist essentially of compounds containing carbon, oxygen, and nitrogen, the last of which is in a state of feeble combination with the whole or part of the oxygen, thus constituting an unstable chemical system. When the explosion takes place, the nitrogen gives up its oxygen to the carbon, for which it has a greater affinity, forming carbon-dioxide and carbon-monoxide gases, the combination being attended by great generation of heat, and the freeing of the nitrogen. In most explosives the carbon is accompanied by hydrogen, which by its combustion produces an extremely high temperature and combines with a part of the oxygen to form water in the state of greatly expanded vapor.

Other subordinate elements are often present; thus, e.g., in gunpowder the potassium holds the nitrogen and oxygen loosely together as saltpetre, and there is sulphur, a second combustible whose oxidation evolves even greater heat than carbon. When potassium chlorate is present, the chlorine acts the same as the nitrogen and is set free in the gaseous state. The foregoing description illustrates those explosives in which the decomposition may be considered a process of oxidation, but there are cases in which an explosion occurs by the simple dissociation of a compound without oxidation; thus, nitrogen chloride and nitrogen iodide contain neither carbon nor oxygen, and their great explosive violence is explained by the feeble affinities of nitrogen for other elements.

Explosive Mixtures of the Nitrates. This class consists of those compounds which are mechanical mixtures of nitrates with some base, such as charcoal or other substance containing carbon, and usually also sulphur. The nitrates are the source of the oxygen which on explosion combines with the carbon of the charcoal, producing large volumes of gases, so that the mixture when confined will at the time of explosion be accompanied by a violent disrupting action. The typical representative of this class is black gunpowder, for a description of the manufacture of which, see GUNPOWDER. The standard composition of gunpowder is potassium nitrate (saltpetre) 75 parts, charcoal 15 parts, and sulphur 10 parts; although these ingredients necessarily vary according to the uses for which the powder is desired, i.e., whether for blasting, sporting, or warfare. They must also be so combined that (1) the combustion may be complete and little residue left after explosion; (2) that the powder shall not readily absorb or retain moisture; (3) that its explosive properties shall not be greater than required; and (4) it shall be hard and dense enough to bear transportation without disintegrating. Excess of carbon and sulphur prevents perfect combustion and lowers the explosive force, while too great an amount of potassium or sodium chloride in the saltpetre will make the powder hygroscopic. Disintegration may be prevented by proper incorporation and pressing. Good gunpowder should have a density between 1.5 and 1.85, and the most acceptable powders for use as propellants are those that are the most dense. Its exploding point ranges from 270° C. for blasting powder, 275° C. for rifle powder, and 315° C. for the best sporting powder.

Among the explosive compounds in this class may be mentioned: *amide powder*, consisting of a mixture of ammonium and potassium nitrates with charcoal; *azotine*, consisting of sodium nitrate 69.04 parts, carbon 15.23 parts, sulphur 11.43 parts, and petroleum, 4.29 parts; *carboazotine*, consisting of potassium nitrate 61.04 parts, ferrous sulphate 13.58 parts, soot 24.65 parts, and sulphur 13.58 parts; *diorexine*, consisting of potassium nitrate 50 parts, sodium nitrate 25 parts, sulphur 12 parts, and sawdust from hard wood 13 parts; *johnite*, consisting of potassium nitrate 75 parts, sulphur 10 parts, lignite 19 parts, sodium picrate 3 parts, and potassium chlorate 2 parts; *petralite*, consisting of potassium nitrate 64 parts, impregnated wood or charcoal 30 parts, crude antimony 6 parts: *pyrolite*, consisting of potassium nitrate 51.50 parts, sodium nitrate 16 parts, sulphur 20 parts, sawdust 11 parts, and charcoal 1.50 parts; and *saxifragine*, or *poudre barytique*, a mixture of barium nitrate and charcoal with a small portion of potassium nitrate.

Explosive Mixtures of the Chlorates and Perchlorates. On account of the readiness with which potassium chlorate lends itself to the production of powerful explosives, it has been frequently used by inventors to produce explosive mixtures. It will react with almost any carbonaceous material, and most of its mixtures will readily explode by friction. The tendency of such mixtures to spontaneous ignition, as well as their sensitiveness to percussion, has till recently prevented their extensive adoption. Among the mixtures in this class that may be mentioned are the following: *asphaline*, consisting of potassium chlorate 54 parts, potassium nitrate and sulphate 4 parts, mixed with bran 42 parts; *Ehrhardt powder*, consisting of a mixture of tannin, powdered nutgalls, or cream of tartar, with potassium chlorate; *Fontaine powder*, consisting of a mixture of potassium chlorate and potassium picrate; *Horseley powder*, consisting of potassium chlorate 6 parts, nutgalls 1 part, and charcoal 1 part, mixed with 72 parts of nitroglycerin (this may also be classed as a dynamite); *Kellow safety powder*, consisting of spent tan and sawdust saturated with potassium or sodium nitrate and a little potassium chlorate, and then mixed with sulphur; *Michalowoski blasting powder*, consisting of potassium chlorate 50 parts, manganese dioxide 5 parts, and finely pulverized organic matter, as bran, 45 parts; *Oriental powder*, consisting of potassium nitrate and crude gamboge mixed with potassium chlorate; *pyronome*, consisting of potassium nitrate 69 parts, sulphur 9 parts, charcoal 10 parts, metallic antimony 8 parts, potassium chlorate 5 parts, rye flour 4 parts, and a small quantity of potassium chromate; *racka-rock*, consisting of potassium chlorate 79 parts, and mononitrobenzene 21 parts, which are prepared separately and combined only when about to be used; *tutonite*, consisting of potassium chlorate mixed with sulphur and metallic sulphides; and *white powder*, consisting of a mixture of sugar, potassium ferrocyanide, and potassium chlorate. A modern development has resulted in the casting of the grains of the components with a plastic and somewhat elastic cover serving as a cushion and also in substituting perchlorates for chlorates, whereby explosives less sensitive to friction or percussion have been obtained. These were styled cheddites, but there are now several variants.

Explosive Compounds Derived by Nitro-Substitution. This class consists of a series of compounds formed by treating certain hydrocarbons, usually coal-tar products, with nitric acid, thereby producing new chemical compounds which are relatively unstable, and contain elements that are capable of uniting to form stable gases and produce high temperatures in the process of reacting. These explosives accomplish their purpose by a dissociation of the constituent elements of the compound, which then recombine into a variety of gaseous compounds. These explosives are sometimes called "safety explosives" and have considerable economic value, especially for blasting purposes, largely owing to the fact that they give off flames of short duration and have a high rending or expansive force. While used alone for military purposes and in detonating fuse, they are usually, in blasting, made components of mixtures such as the following: *ammonites*, or *Favier explosives*, consisting of ammonium nitrate 88 parts, mixed into 12 parts of melted dinitronaphthalene; *bellite*, consisting of ammonium nitrate 5 parts, and metadinitrobenzene 1 part, melted together, and potassium nitrate stirred into the mixture; *Borlinetto powder*, consisting of picric acid 10 parts, sodium nitrate 10 parts, and potassium chromate 8½ parts; *extralite*, consisting of a mixture of ammonium nitrate, potassium chlorate, and naphthalene; *joveite*, consisting of varying proportions of nitronaphthalene (8 to 6 parts), nitrophenol (16 to 30 parts), and sodium nitrate (76 to 64 parts); *roburite*, consisting of a mixture of ammonium nitrate and well-purified chlorinated dinitrobenzene; *romite*, consisting of a mixture of ammonium nitrate, potassium chlorate, and naphthalene; *securite*, a mixture of ammonium nitrate and dinitrobenzene; and *Volney powder*, consisting of potassium nitrate, sulphur, and nitronaphthalene. Many of these pass into the Sprengel class and the importance of ammonium nitrate in military explosives is referred to later.

Explosive Compounds of the Nitric Derivatives. This group of explosives consists of nitric esters of cellulose, glycerin, or other hydroxy compounds. In the first case the cellulose is treated with nitric and sulphuric acids, forming *guncotton*, and in the second case glycerin yields, by the action of these acids, *nitroglycerin*. According to the proportions used the mono-, di-, or tri-nitro derivatives of glycerin or a multiple of them for cellulose may be obtained. This class is by far the largest one, and too numerous to admit of a general description, in consequence of which the peculiar properties of each will be described under their special headings. *Guncotton* is an important member of this class. It consists of cellulose such as pure cotton treated with a mixture of nitric acid and sulphuric acid. It is employed chiefly for military purposes and is regarded as very safe. (For a detailed account of its manufacture, and of the various uses to which it is applied, see the article GUNCOTTON.) Among the various guncotton mixtures, which differ from each other in the proportions of their ingredients and methods of preparation, are the following, which are now seldom used, although valuable on account of their safety: *potentite*, a mixture of 62.2 parts guncotton and 33.8 parts potassium nitrate compressed into cartridges; *tonite*, or *cotton powder*, a preparation consisting of 52.5 parts of finely divided or macerated guncotton with 47.5 parts of barium nitrate, which is made up into cartridges coated with paraffined paper. A small percentage of fine metallic aluminum is sometimes added to these mixtures to increase the energy of the explosion.

The value of cellulose nitrate as an explosive led to its use in the manufacture of *blasting gelatin*, invented by Nobel in 1875, which is accomplished by dissolving the soluble variety in nitroglycerin. This has been made up into various forms and also combined with absorbents, forming *gelatin dynamites*, which have been used for blasting purposes. In this class should be included *forcite*, consisting of blasting gelatin (nitroglycerin 98 parts, collodion cotton 2 parts) 50 parts and absorbent (sodium nitrate 76 parts, sulphur 3 parts, wood tar 20 parts, wood pulp 1 part) 50 parts; and *gelignite*, consisting of blasting gelatin (nitroglycerin 96 parts, collodion cotton 4 parts) 65 parts, and absorbent (sodium nitrate 75 parts, sodium carbonate 1 part, wood pulp 24 parts) 35 parts.

Smokeless Powders, representing the latest development of cellulose nitrates as explosives, consist either of one which by the aid of a solvent has been converted into a collodized mass which has been formed into flakes or cords, and dried into a hard hornlike material, or of a powder in which a mixture of cellulose nitrate and nitroglycerin is transformed into a similar hornlike substance either with or without the aid of a solvent. In the first class are the *Abel powder*, consisting of a cellulose nitrate brought into the colloidal condition superficially by treatment with ether alcohol; *poudre B* of Vieille, used in France, consisting of cellulose nitrate mixed with barium nitrate, potassium nitrate, and sodium carbonate, and treated with either ether alcohol, ethyl acetate, or acetone; *indurite*, consisting of cellulose nitrate of the highest nitrate collodized and then indurated; and *Wetteren powder*, used in Germany, and consisting of nitrocotton 48.15 parts, guncotton 30.73 parts, charcoal 12.12 parts, volatile matter 8.22 parts, and humus 0.77 part. The foregoing are typical of the military smokeless powders. Sporting powders of similar character are now made, in which the process of manufacture and the proportions of the ingredients are changed to produce the desired results. Of the second class, the most important are: *amberite*, consisting of trinitrocellulose 44 parts, dinitrocellulose 12 parts, and nitroglycerin 40 parts, formed into grains and treated with solvent, consisting of sulphuric ether with a little alcohol; *ballistite*, consisting of guncotton 40 parts, dissolved in nitroglycerin 60 parts, to which a small quantity of aniline has been added as a neutralizing agent; *cordite* (q.v.) originally consisting of nitroglycerin 58 parts, guncotton 37 parts, vaseline 5 parts, dissolved in 19.2 parts of acetone; *filite* is similar to ballistite and is used in Italy for military purposes. Certain varieties of smokeless powders consist of nitrocellulose combined with nitro derivatives of aromatic hydrocarbons, and included in this class are *Du Pont powder*, consisting of nitrocellulose brought into the colloidal condition by nitrobenzene or other solvent; the last-named powder is of American origin. See SMOKELESS POWDERS.

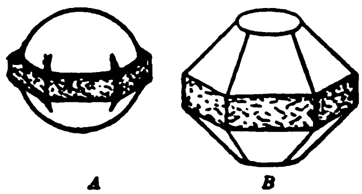
Nitroglycerin. This most powerful explosive, which was discovered by Ascanio Sobrero, in Turin, Italy, 1847, is a colorless or light yellow oily liquid made by passing pure glycerin into a mixture of concentrated nitric acid and sulphuric acid at low temperature. It explodes violently at about 218° C. Its liquid state renders it dangerous in general use as an explosive, though it is still used in this state in oil wells and under analogous conditions. When absorbed with a suitable absorbent, this danger is reduced, and this has given rise to the devising of a very important series of explosives known generically as *dynamites*, which may be again subdivided into two principal groups, viz., dynamites with an inert absorbent or "dope" and dynamites with an active absorbent or "dope." The type of the first group is the original dynamite invented by Nobel in 1866, who used for his absorbent diatomaceous silica, siliceous marl, tripoli, or rotten-stone, commonly called kieselguhr. It is made of various degrees of strength, ranging from nitroglycerin 75 parts and absorbent 25 parts, down to nitroglycerin 30 parts and absorbent 70 parts. Other explosives of this class are *carbodynamite*, consisting of nitroglycerin 90 parts and charcoal made from cork 10 parts, and *cerberite*, consisting of nitroglycerin modified with wood tar and nitrobenzene with charcoal as an absorbent. The second group comprises those dynamites that are composed of nitroglycerin and an active absorbent, usually a nitrate mixture. The following are among the better-known dynamites of this group, the ingredients of which vary in amount according to the special purpose for which they are intended, so that the proportions mentioned are typical of only one variety: *atlas powder*, consisting of nitroglycerin 75 parts, wood fibre 21 parts, sodium nitrate 2 parts, magnesium carbonate 2 parts; *carbonite*, consisting of wood meal 40½ parts, sodium nitrate 34 parts, nitroglycerin 25 parts, and sodium carbonate one-half part; *dualin*, consisting of nitroglycerin 40 parts, sawdust 30 parts, potassium nitrate 20 parts; *giant powder*, consisting of nitroglycerin 40 parts, sodium nitrate 40 parts, powdered resin 8 parts, kieselguhr 8 parts, sulphur 6 parts; *Hercules powder*, consisting of sodium nitrate 45 parts, nitroglycerin 40 parts, wood pulp 11 parts, sodium chloride 1 part, and magnesium carbonate 1 part; *Judson powder*, consisting of sodium nitrate 64 parts, sulphur 16 parts, cannel coal 15 parts, nitroglycerin 5 parts; *lithofracteur*, consisting of nitroglycerin 54½ parts, kieselguhr 16¾ parts, barium nitrate 14¾ parts, sulphur 7 parts. manganese 2 parts, soda 2 parts, wood meal 2 parts, bran 1 part; *meganite*, consisting of nitroglycerin 60 parts, sodium nitrate 20 parts, nitrated vegetable ivory 10 parts, nitrated wood 10 parts; *vigorite*, consisting of potassium chlorate 49 parts, nitroglycerin 68 parts, kieselguhr 20 parts, potassium nitrate 7 parts, magnesium carbonate, moisture, etc., 5 parts; and *Vulcan powder*, consisting of sodium nitrate 52.5 parts, nitroglycerin 30 parts, charcoal 10.5 parts, and sulphur 7 parts. Mixtures to meet special conditions in mining are now compounded. Short-flame, cool explosives are especially desired in coal mining.

One of the objections to nitroglycerin as well as to the dynamite formed from it has been the freezing at low temperatures and the danger of explosion when thawing it. This is now obviated in large degree by the use of dinitroglycerin, nitro-substitution compounds, and other chemicals in the mixtures. These are styled L. F. dynamites.

Sprengel Explosives and Panclastites. In 1873 Dr. Hermann Sprengel described a class of explosives consisting of two inexplosive ingredients, which, when mixed together, yielded a compound capable of violent detonation. The safety with which the components of explosives could be transported to the place of action and compounded on the spot led to their study by the experts on explosives of various governments, and a number of valuable preparations of this class have since been patented in different countries. A number of these, such as *rackarock*, have already been described under *Explosive Mixtures of the Chlorates*, and *ammonites*, *bellite*, *roburite*, *romite*, and *securite* under *Explosive Compounds Derived by Nitro Substitution*. In addition to these there should be mentioned *hellhoffite*, consisting of nitric acid with a specific gravity of 1.5, 53 parts, and metadinitrobenzene 47 parts; and *panclastite*, consisting of nitrotetroxide combined with some combustible substance, such as a hydrocarbon, vegetable, animal, and mineral oils, fats, and their derivatives, but preferably with carbon disulphide. In this class may be included the picric acid compounds, which consist of trinitrophenol or picric acid brought into a dense state by fusion and used as a filler for shells. This explosive, differing only in the details of its manufacture, which are kept secret by the respective governments, is called *lyddite* in England and *melinite* in France. The ammoniation of picric acid gives *ammonium picrate*, a compound less sensitive and less likely to form sensitive salts with metals. It is used as an explosive charge of armor-piercing projectiles.

Fulminates and Amides. The fact that certain nitrates, when heated with alcohol and an excess of nitric acid, yield peculiar crystalline, easily detonating precipitates, has been known for more than a century, and this property has been taken advantage of in the preparation of explosives. The best-known member of this class is the *mercury fulminate*, which is made by dissolving mercury in nitric acid, which solution, when cool, is added to alcohol. The gray explosive mercury fulminate is formed as a precipitate by reaction between them. The precipitate is then carefully washed and air-dried. It is exceedingly sensitive to heat and shock of any kind, and may be detonated by heat at a temperature variously given from 149° C. to 200° C. The *silver fulminate*, which is formed by heating an aqueous solution of silver nitrate with strong nitric acid and alcohol, is similar. Mercury fulminate finds an extensive application in detonators for guncotton and nitroglycerin compounds; also in percussion caps and primers.

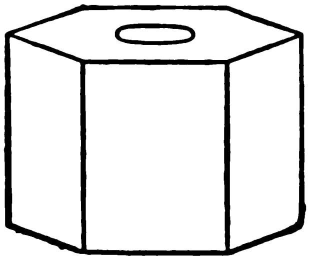
Military Uses of Explosives. In times of peace the principal use of explosives is in mining and engineering enterprises. In the military and naval services, as well as in sporting rifles, they are employed as propelling and as bursting charges for projectiles. An explosive for use as a *propelling* charge in a gun should give in that gun as low maximum pressures and as high projectile velocity as possible. The older powders were finely pulverized. About 1860 and later it was customary to press the powder mixture into a cake, that was afterward broken between rollers into irregular grains which were sorted by screens into different sizes—musket, mortar, cannon, and mammoth; the latter from 0.6 inch to 0.9 inch. At this date (1860) General Rodman proposed cylindrical cakes nearly the diameter of the bore and 3 inches long, pierced by ¼-inch holes ¾ inch apart, reasoning that the burning on the inner surfaces of these holes would give a constantly increasing surface, and therefore an increasing rate of generation of gas—a condition which he recognized to be desirable. At the time this form was not deemed preferable to the mammoth, and his principle was adopted only after a number of years, and was preceded by the use of other powders—as the spherohexagonal—molded simply



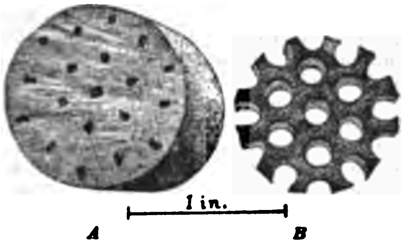
BLACK POWDER.
A, spherohexagonal grain. *B*, hexagonal grain.

for uniformity of size. His grain when adopted was modified to a hexagonal prism about 1 inch long and wide, pierced by one or several holes.

About 1882 the Germans introduced "brown" or "cocoa" powder in the same form grains, but using charcoal not so much baked and therefore giving a slower powder. A "slow-burning" cocoa powder soon came forward as an improvement. Long-continued efforts were made to get a powder of more power per unit of volume, which would give in the reduced-calibre small arm a higher velocity than gunpowder, with permissible pressures. The high explosives were tried, especially cellulose nitrate, in many forms, pressed and mixed with other substances, but with resulting high pressures and detonations, until, about 1884, dissolved cellulose nitrate gave after evaporation of the solvent a horny mass, which burned regularly without detonation. Similar treatment of combinations of cellulose nitrates and nitroglycerin gave similar results. It had been known that these explosives gave no smoke, their products being gaseous, but it was the desire for more power which brought them into use. The French quickly recognized the value of smokelessness as well as of power and soon extended the use of the poudre B of this class to all their cannon. The Germans used Wetteren, and later ballistite. The English later adopted cordite. Of these four powders the first two are made of cellulose nitrates and the others of this and nitroglycerin. In the United States it was not until well after 1890 that smokeless powders were adopted; for, although their advantages were recognized and many kinds experimented with, a later and more advanced stage of development was awaited. The navy adopted smokeless powder earlier than the army did. Cellulose nitrate powders are most generally used in the United States. The forms of grain are many—long cords, spaghetti-like tubes, thin flakes, cubes, pierced prisms (generally for large guns), and others. American smokeless powder and its manufacture had reached such a stage of development that when the United States entered the World War in 1917, but little change in product or methods of manufacture save in details were required. Following the example of Germany it was determined to use cellulose produced from wood pulp in place of cotton.



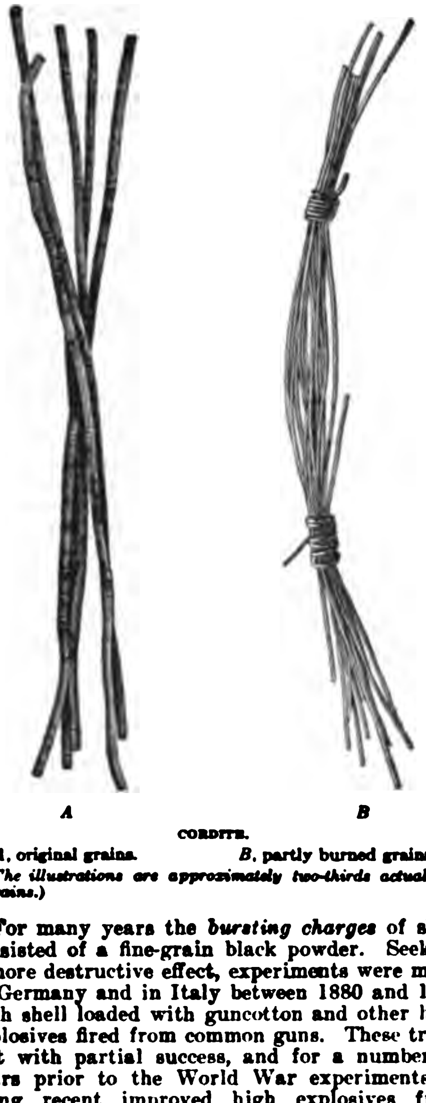
BROWN OR COCOA POWDER.
Hexagonal pierced prism grain.



SMOKELESS POWDER.
Pierced cylinder grains for large guns.
A, original grain. B, partly burned grain.

SMOKELESS POWDER.
Hexagonal prism with one hole. Partly burned grain.
(Outline shows original form.)

A water-drying process was developed during the World War which materially reduced the time of drying and also an alcoholic drying process, which in addition gave a better grade of powder.



CORDITE.
A, original grains. B, partly burned grains.
(The illustrations are approximately two-thirds actual size of grains.)

For many years the *bursting charges* of shell consisted of a fine-grain black powder. Seeking a more destructive effect, experiments were made in Germany and in Italy between 1880 and 1890 with shell loaded with guncotton and other high explosives fired from common guns. These trials met with partial success, and for a number of years prior to the World War experiments in firing recent improved high explosives from common guns were in progress. Lyddite (used by the English), melinite (used by the French since 1887), explosives in which picric acid figured were used in the World War while before that time thorite, joveite, etc., had been tried by the United States. The Japanese Schimose was melinite in the form of a practically pure picric acid. Special shells in the earlier days were devised with numerous separated compartments. The intent was to keep the charge from explosion from the shock produced by the settling down of a long column of powder upon discharge, without interfering with complete detonation upon impact. The Gathmann system comprised a large shell carrying wet and dry guncotton carefully packed and fired with a special fuse. The charge was expected to explode against the side of a vessel with such force as to burst in her armored sides. Tests made in 1901–02 failed to demonstrate the success of the system, and it was officially decided to discontinue further experiments.

Meanwhile maximite and explosive "D," ammonium picrate, had been developed which could be fired safely in armor-piercing projectiles through an 11½-inch plate of best modern Krupp face-hardened armor and detonated on the inside with most destructive effect by a delay-action fuse. Explosive "D" was used by the United States Army as the bursting charge of shells of 10-inch caliber and more in the World War, and it figured extensively on the programme of explosives.

During the World War the United States Ordnance Department developed a standard policy for the use of high explosives. Trinitrotoluol or T. N. T. was selected for shell between and including the caliber of 75 millimeters and 4.7 inches; Amatol for shell calibers between 4.7 inches and 9.2 inches, including the latter; and ammonium picrate, or explosive "D," for shells of 10-inch caliber and higher. This conserved the T. N. T. supply.

In the World War T. N. T. or *trinitrotoluol* was the high explosive used as a bursting charge in the leading armies. It was adopted in the United States as stated for shells between and including the calibers of 75 millimeters and 4.7 inches, and, in combination with ammonium nitrate, for amatol for larger caliber shells. T. N. T. was made as early as 1880, and its manufacture was started in Germany in 1891. In 1902 the Germans adopted T. N. T. for filling shell and other purposes, and in 1907 it was also adopted by Italy under the name of tritolo and by Russia soon afterwards. In the British service trinitrotoluol received its familiar name of T. N. T., and it is also known as trotyl. Other names for it are trinol and trilite. In the manufacture of T. N. T. toluol is the basic raw material and ordinarily is secured from by-product coke ovens. During the World War methods were developed whereby toluol also could be obtained by the stripping or absorbing of it from carbureted water and coal gas, and by the breaking down or cracking of oils. All of these methods were employed extensively in the United States during the war, and for the last named three special operations were developed for treating petroleum distillate or naphtha. In the United States three grades of T. N. T. were produced: Grade I, used for booster charges, that is, those charges which initiate the explosive wave in the main-shell charge; Grade II was used as a shell filler, while Grade III was employed with ammonium nitrate in the production of amatol.

Amatol was a high explosive developed by the British during the war and consisted of a mixture of trinitrotoluol—T. N. T.—and ammonium nitrate. In the United States ammunition programme amatol was employed for shells of caliber between 4.7 and 9.2 inches, including the latter, and was particularly useful as it was less expensive to prepare than T. N. T. alone, and at the same time there were available considerable supplies of ammonium nitrate. *Ammonal*, a similar mixture, was used by the Austrians.

Ammonium nitrate was used principally with T. N. T. in the manufacture of amatol, and is manufactured by neutralizing nitric acid by ammonia, the resulting product being a crystal which is available as a high explosive. During the war new processes were developed in England for the production of ammonium nitrate and the commercial resources of the United States for such production were vastly increased. In the Scandinavian countries ammonium nitrate is manufactured from nitric acid made by the fixation process possible by the cheap water power. It was to obtain adequate supplies of ammonia that the large nitrogen fixation plants were developed during the war, and special ammonium nitrate fixation plants were built by the United States government.

Tetryl, used by the French and English as a bursting charge for shell during the World War, was more sensitive than T. N. T. and had a high rate of denotation, but in the United States was employed only as a loading charge for boosters. There was the further objection of its high cost and lack of manufacturing facilities for its production. T. N. A. or *tetranitroanaline*, an explosive for the loading of boosters and fuses, was employed by the Russian government, being manufactured in the United States. It was, however, adopted for the United States service. *Lyconite* was developed by the Du Pont Company and authorized by the United States Army for use in the loading of drop bombs. *Anilite* was a liquid explosive used by the French, but improved so as to render it safer. It had not been adopted by the United States Army prior to the Armistice.

Nitrostarch was an explosive which had been under development in the United States for commercial purposes prior to the war, but with limited success. However, after further experiments and investigation, several nitrostarch explosives were adopted by the United States Army for filling hand and rifle grenades, trench mortar shells and drop bombs. The advantage of this material was the ease of loading, the use of materials generally available and their low cost. During the war there were loaded with nitrostarch explosive 7,244,569 defensive hand grenades, 1,526,000 offensive hand grenades, 9,921,533 rifle grenades and 813,073 3-inch trench-mortar shells. The average monthly production of nitrostarch by November, 1918, was 1,720,000 pounds, and a nitrostarch explosive known as *grenite* was tested and authorized for use during the war.

Manufacture of Explosives in the United States. The manufacture of explosives is now one of the most important of the chemical industries in the United States. Its growth, as will be seen from the accompanying table from successive census reports, has been most rapid, and the 118 establishments manufacturing explosives in 1919 were located in 24 different States and had a total production valued at $92,474,813. In addition there were factories belonging to the government. That the production of explosives in the United States is not entirely for domestic consumption is shown by the fact that the exports of gunpowder in the year 1920 amounted to 43,907,793 pounds, valued at $38,368,157;

those of dynamite amounted to 15,641,981 pounds valued at $3,210,481 and all other explosives were valued at $2,281,479, so that including cartridges, shells and projectiles loaded, and fuses, the total exports of explosives aggregated in value $56,846,698 for the year.

TOTAL PRODUCTION AND VALUE OF EXPLOSIVES, BY DECADES: 1840 TO 1919

YEAR	Number of establishments	Capital	Average number of wage earners	PRODUCTS	
				Pounds	Value
1840...	137	$875,875	496	8,977,348	....
1850...	54	1,179,223	579	....	$1,590,332
1860...	58	2,305,700	747	....	3,223,090
1870...	36	4,099,900	973	....	4,237,539
1880...	54	6,585,185	1,340	....	5,802,029
1890...	69	13,539,478	2,353	98,645,912	10,993,131
1900...	97	19,465,846	4,502	215,980,719	*16,950,976
1909†..	88	50,167,976	6,274	487,481,252	37,983,868‡
1914§..	111	71,351,414	6,306	481,752,040	41,432,970**
1919§..	118	133,247,684	9,249	....	92,474,813

* This value is for the explosive substances only. When materials of all kinds produced in these establishments are included, the value is $17,125,918.

† Thirteenth United States census, 1910, 124 plants were represented.

‡ In addition 1,471,042 pounds, valued at $656,969, were made by Federal establishments and 219,356 pounds, valued at $135,979, were made by establishments engaged primarily in the manufacture of "firearms and ammunition."

§ Census of manufacture.

** In addition 5,072,387 pounds, to the value of $1,632,335, were made by Federal establishments, comprising 4,998,537 pounds of smokeless powder and 73,850 pounds of other explosives.

The outbreak of the World War in 1914, naturally gave a great impetus to the explosives industry in the United States as considerable quantities were manufactured for export to the belligerent nations. The result was that the interval prior to the entrance of the United States into the war was one of considerable growth and expansion, so that in 1917 when America joined the Allies her private works were in readiness for increased production while government or government aided plants were planned and built on a vast scale, many of which came into production before the Armistice was declared. Manufacturing facilities were developed on such a scale that during the nineteen months the United States was engaged in the war American powder plants produced 632,504,000 pounds of propellants as compared with 342,155,000 for France and 291,706,000 for Great Britain. At the signing of the Armistice there were on hand approximately 200,000,000 pounds of smokeless powder and 6,850,000 pounds of black powder. The American production of ammonium nitrate from all sources at the time of the signing of the Armistice was 20,000,000 pounds a month. The production of picric acid in November, 1918, amounted to 11,300,000 pounds, while the average monthly production of ammonium picrate had increased to 950,000 pounds.

In the same space of time the United States produced 375,656,000 pounds of high explosives for loading into shells as compared with 65,110,000 pounds for England and 702,964,000 pounds for France for the same period. At the time of the Armistice the United States had a monthly capacity for manufacturing propellants of 42,775,000 pounds as compared with 17,311,000 pounds for France and 12,055,000 for England. During the war the United States developed 53 new plants for making explosives and propellants and loading them at a cost of approximately $360,000,000. In August, 1914, the American production of trinitrotoluol for commercial purposes amounted to approximately 600,000 pounds a month, mostly used for making explosives for blasting. By April, 1917, this production had been increased to 1,000,000 pounds a month, exclusive of that which was being used commercially, and by November, 1918, the production had been developed to 16,000,000 pounds a month, two government plants being in course of erection, one with a capacity of 4,000,000 pounds a month, the other with 2,000,000 pounds a month.

The production of explosives in the United States for the calendar year 1920, including exports, amounted to 537,954,750 pounds of which 254,879,825 pounds, or 47 per cent, was black blasting powder; 229,112,084 pounds, or 43 per cent was high explosives other than permissible explosives, and 53,962,841 pounds, or 10 per cent, was permissible explosives. The amount of permissible explosives sold in 1920 was never before equalled, and sales of black powder were with one exception for 1917 higher than for any other year.

Naturally the mining industry consumed the greater part of the explosives, taking 75.1 per cent of the total in 1920. The principal increase was in coal mines, an industry that ordinarily takes over 80 per cent each of all black powder and permissible explosives and about 15 per cent of high explosives, over one half of these three classes combined.

The amount of explosives exported from the United States in the year 1920, aggregated in value $56,846,698. In 1919, the total value of explosives exported were valued at $28,399,707; while in 1918 exports were $243,528,539; in 1917, $639,934,405; in 1916, $715,575,306; in 1915, $188,969,893; in 1914, $10,037,587, and in 1913, $5,525,077.

Commercial Explosives Used in Engineering and Mining Operations. The manufacturers of commercial explosives have developed a wide range of products so that for almost every kind of operation requiring its use in engineering or mining a suitable explosive is available. See BLASTING. Naturally there is a wide diversity in their use and in the various explosives appropriate for such uses. For example, many explosives that can be employed for work cannot be used in deep mines or in close workings, while in such work as metal mining and in driving tunnels it is necessary also to consider the character of the gases evolved on detonation. In coal mines, too, especially those that are gaseous or dusty, an explosive must be employed where the flame temperature and the height and duration of the flame are sufficiently reduced to permit of safe working. If the blasting is carried on under conditions of dampness or in water, a special explosive must be sought which is impervious to moisture, while for use in cold climates it is desirable to use explosives that do not require thawing if they are satisfactory in other respects. On the other hand in the tropics care must be taken that the explosives selected are not liable to change in their chemical or physical characteristics or to other deterioration.

In open-air work, such as breaking down rock in quarries, the explosives more generally employed are black blasting powder, granulated nitroglycerin powder, containing from 5 to 15 per cent of nitroglycerin, "nitroglycerin dynamites" containing 15 to 60 per cent of nitroglycerin, low-freezing dynamites, sold on a basis of the equivalent percentage of the strength of the "straight" nitrodynamites, and also ammonia nitrodynamites, which the explosive industry rates in a similar commercial manner. Coal miners in their blasting also employ blasting gelatin, gelatin dynamites, ammonium nitrate powders, containing nitro substitution powders, chlorate powders, and the so-called nitro-starch powders. In mining and tunneling some of the foregoing explosives would not be suitable as they do not develop the requisite disruptive force, and in many cases produce poisonous gases which affect the atmosphere of the working place. There is also an economic reason, namely, that it is more economical in tunnel work to drill a few holes and to load them with a more powerful explosive of greater disruptive force than to drill a large number of holes and to employ weaker and cheaper explosives. Accordingly there has been found that two main classes of explosives develop the necessary disruptive force required in blasting hard rock in metal mining and tunneling. These are "straight" nitroglycerin dynamites and gelatin dynamites which are specially made from formulas that provide a requisite amount of oxygen by supplying a decreased percentage of combustible materials. In a gaseous or dusty coal mine it is also found necessary, in addition to securing the requisite qualities of strength and efficiency to break down the coal, that there should be a relatively short flame of relatively low temperature. Accordingly, what are known as permissible explosives, referred to in the following paragraph, have been developed and are now used in every coal mining state in the Union. These are thoroughly tested by the United States Bureau of Mines at its Pittsburgh testing station, where there is a large steel cylinder or gallery which can be filled with fire damp or coal dust and air.

Permissible Explosives in the United States are blasting explosives that, having passed certain tests prescribed by the United States Bureau of Mines, are considered suitable for use in gaseous or dusty coal mines, when used in the manner prescribed by the bureau. The chief characteristics that an explosive must possess in order to pass the tests are: (1) Relatively low temperature resulting on explosion, (2) a minimum amount of explosion flame. Mixtures of natural gas and air are exploded when exposed to a temperature of about 650° C. for about one-tenth of a second, but are not acted upon by flame of much higher temperature if the flame is of sufficiently short duration. Thus, although the flame temperature of most permissible explosives lies between 1500° and 2000° C., they do not ignite the most explosive mixtures of gas and air because of the rapidity of their explosion, the duration of their flame being only about two to five ten-thousandths of a second. Black powder, on the other hand, has a flame temperature of over 2200° C., and a duration of flame, under the same conditions of test, of approximately one second. Ordinary 40 per cent nitroglycerin dynamite gives a flame duration of only about four ten-thousandths of a second, but its flame temperature is about 2900 degrees. Both black powder and dynamite, then, fail to pass the tests for permissibility, black powder because of the long duration of its flame, and dynamite because of the high temperature of its flame. The problem in producing permissible explosives is therefore to formulate explosive mixtures such that, while giving a minimum amount of flame of short duration and low temperature, they will develop sufficient energy to do the work of breaking down coal in an economical manner. An example is cited below: By proper additions of various ingredients, ordinary dynamite can be so altered in composition that its flame temperature will be reduced sufficiently to render the resulting explosive "permissible." If, for example, a large excess of carbonaceous combustible material, such as wood pulp, flour or corn meal, is added, the gaseous products of explosion are so altered that the flame temperature is greatly reduced. The same effect is obtained by the addition of water, either in the liquid state, in which form it is absorbed by the other ingredients of the explosive, or in the form of water of crystallization in such crystalline salts as alum, or magnesium sulphate, both of which contain about 50 per cent of water of crystallization. Similarly, the addition of inert solid matter, such as clay of powdered rock, which simply absorbs part of the heat liberated by the explosive reaction, or of readily volatile inert material such as certain ammonium salts, which consume heat in being volatilized, will also produce the characteristics of permissible explosives. Although such additions naturally lower the strength of the explosive, it is possible to obtain the desired end and still produce explosives entirely suitable for use in coal mining, as is evidenced by the fact that there were on June 1, 1921, 154 explosives on the "permissible list." Careful chemical analyses are made of every explosive received for test, in order to determine whether the explosive possesses any objectionable chemical features. Field samples, collected from time to time, are also analyzed in order to ascertain whether the different permissible explosives are being manufactured in accordance with the composition of the original sample submitted for test. The difficulties encountered by the chemist in analyzing such explosives may be realized when it is known the manufacturers use a great variety of ingredients in bringing about the desired results. About 60 to 70 ingredients have been found in the various permissible explosives analyzed in the bureau laboratory.

Permitted Explosives. The term applied by the English Government to explosives authorized for use in coal mining after they have successfully passed the test prescribed by His Majesty's Inspectors of Explosives, by which to fix their degree of safety and the best conditions for use.

Transportation and Storage of Explosives. Under Act of March 4, 1909, and Section 15 of the Act to Regulate Commerce as amended June 18, 1910, the transportation of explosives in the United States is forbidden except under conditions prescribed by the Interstate Commerce Commission, which has since then from time to time formulated regulations under the advice of the Bureau for the Safe Transportation of Explosives and other Dangerous Articles of the American Railway Association, to which it has delegated power of inspection and investigation. For transportation purposes explosives are divided into "forbidden explosives," such as liquid nitroglycerin, and "acceptable explosives," such as gunpowder and dynamite containing 60 or less per cent of nitroglycerin.

The storage of explosives is regulated by State and municipal laws and ordinances which relate usually to the kind and location of magazines and particularly their nearness to highways and habitations. In the years immediately preceding the entrance of the United States into the Great War there were a number of serious disasters due to explosions at factories and elsewhere. In these criminal intent as well as accidental causes figured, and accordingly it was found necessary to pass a "Federal Explosives Act." This was approved Oct. 6, 1917, and aimed to prohibit any manufacture, distribution, storage, use and possession in time of war of explosives, and at the same time provided regulation for the safe manufacture, distribution, storage, use and possession, and in other ways aimed to protect the country and the public generally. This involved a system of local licenses administered by the Bureau of Mines through various local agencies. Under this act such matters as improper storage, thefts from magazines, bomb outrages, magazine construction, transportation and general care in handling were dealt with in an efficient and effective manner. After the Armistice, however, the regulations established were gradually revoked, so that by 1920 there was no federal supervision and control of explosives, except in interstate commerce. It was felt, however, that peace-time legislation in this field was desirable, giving to the Bureau of Mines a general supervision of explosives and the investigation of accidents.

Literature. The monographs of the leading experts, such as Abel of England, Berthelot of France, Munroe of the United States, and Von Lenck of Austria, form valuable sources of information, in addition to which consult the following more significant modern works: Munroe and Hall, *A Primer on Explosives for Coal Miners* (Washington, 1909); id., *A Primer on Explosives for Metal Miners and Quarrymen* (Washington, 1915); Hall and Howell, *The Selection of Explosives Used in Engineering and Mining Operations* (Washington, 1914); Weaver, *Notes on Military Explosives* (4th ed., New York, 1917); Brunswig, *Explosives*, trans. and annotated by Charles E. Munroe and Alton L. Kibler (New York, 1912); Cundill, *A Dictionary of Explosives* (rev. ed. by J. H. Thompson, London, 1895); Guttmann, *Blasting: A Handbook for the Use of Engineers and Others Engaging in Mining, Tunneling, Quarrying, etc.* (Philadelphia, 1892); Berthelot, *Explosives and their Power*, trans. from the French by Napier Hooke and William MacNab (London, 1892); Eissler, *The Modern High Explosives* (New York, 1893; later ed., London, 1897); Munroe, *index to the Literature of Explosives*, parts i and ii (Baltimore, 1893); Guttmann, *The Manufacture of Explosives: A Theoretical and Practical Treatise on the History, the Physical and Chemical Properties, and the Manufacture of Explosives*, with full bibliography of the subject from 1468 to 1895 (2 vols., London, 1895); Walke, *Lectures on Explosives* (New York, 1897); De Kalb, *Manual of Explosives* (Toronto, 1900); A. Marshall, *Explosives, Their Manufacture, Properties, Test and History* (London, 1917); id., *Explosives* (Philadelphia, 1917); Z. de W. S. Colver, *High Explosives* (London and New York, 1918); J. A. Marshall, *The Manufacture and Testing of Military Explosives* (New York, 1919); R. C. Farmer, *The Manufacture and Uses of Explosives* (London, 1921); S. I. Levy, *Modern Explosives* (London, 1920); G. C. Smith, *T. N. T., Trinitrotoluenes, etc.* (New York, 1918). Various reports during and subsequent to the World War were issued by the Ordnance Departments of the U. S. Army and Navy, some of which are generally available. See GUNPOWDER; GUNCOTTON; DYNAMITE; NITROGLYCERIN; ARTILLERY; BALLISTICS; ORDNANCE; SMOKLESS POWDERS; TRINITROTOLUENES.

EXPO'NENT and **EX'PONEN'TIAL** (from Lat. *exponere*, to set forth, from *ex*, out + *ponere*, to put). An exponent, in the primitive sense, is a number symbol which shows how many equal factors enter into a power; e.g., in 2^3, 3 is the exponent of 2; in a^5, 5 is the exponent of a. The exponent affects only the letter or number adjacent to which it stands, ab^3 meaning $abbb$. While the various forms and the theory of exponents have been matters of growth, the notation as now used was introduced into algebra by the mathematicians of the seventeenth century. Chuquet (1484) had used exponents, but not with the same significance as at present, and a step towards the theory of the subject, including the use of fractional exponents, had long before been made by Oresme (fourteenth century). Kepler (1619) speaks of Bürgi as having written for x, x^2, x^3, x^4, ... 1R, 1z, 1c, 1zz, ... whereas he himself prefers 1, 1^{I}, 1^{II}, 1^{III}, ... Bürgi, however, wrote $\overset{\text{II}}{16}$ for $16x^2$, and $\overset{\text{IV}}{20}$ for $20x^4$. Harriot (q.v.) wrote x^2 for xx, x^3 for xxx. Wallis (1656) explained the expressions x^{-n} and $x^{\frac{1}{n}}$ as indicating the same as $\frac{1}{x^n}$ and $\sqrt[n]{x}$. The theory of exponents has gradually received extensions until it has become an important division of algebra. The following equations show the meanings of various exponents:

$$a^0 = 1,\ a^1 = a;\ a^{-2} = \frac{1}{a^2};\ a^{-n} = \frac{1}{a^n};$$

$$a^{\frac{1}{2}} = \sqrt{a};\ a^{\frac{1}{n}} = \sqrt[n]{a};\ a^{\frac{2}{3}} = \sqrt[3]{a^2}.$$

The fundamental laws of exponents in algebra are:

$$a^m . a^n \equiv a^{m+n};\ a^m : a^n \equiv a^{m-n};$$

$$(a^m)^n \equiv a^{mn};\ (ab)^n \equiv a^n b^n;$$

for all values of m and n. These operations are subject to the associative law (q.v.), $a^{m+n+p} = a^{(m+n)+p}$; to the commutative law, $a^{m+n+p} = a^{p+n+m}$, and to the distributive law, $a^{(m+n)p} = a^{mp+np}$. In quaternions (q.v.) and certain other branches of modern mathematics the conventions as to exponents differ.

Functions in which the variable or variables are involved as exponents are called exponential functions; e.g., $a^x = c$, $x^x = b$, $2^x = 8$. In the last example x evidently equals 3. When such equations cannot be solved by factoring, it is best to apply logarithms (q.v.). Thus, in $2^x = 80$, $x \cdot \log 2 = \log 80$, and $x = \frac{\log 80}{\log 2} = 6.322$. The series $e^x = 1 + x + \frac{x^2}{1 \cdot 2} + \frac{x^3}{1 \cdot 2 \cdot 3} + \frac{x^4}{1 \cdot 2 \cdot 3 \cdot 4} + \cdots$ is called the exponential series. If x is taken as 1, the series gives $e = 2.718281828$ . . . , the base of the hyperbolic logarithms (q.v.).

EXPOSITION. See EXHIBITIONS, INDUSTRIAL.

EXPOSITION OF THE SACRAMENT. In the Roman Catholic service, the public exhibition of the Holy Sacrament, instituted with certain ceremonies for the veneration of the faithful. As early as the thirteenth century the

Sacrament was thus exposed at least on Corpus Christi; but not until the sixteenth century did it become customary to expose the Host at other times, as on occasions of public distress, when it is said to have been introduced by a Capuchin of Milan, Father Joseph, who died in 1556. The practice is still in use of placing the Host within the monstrance above the altar and appointing persons to relieve each other night and day in watching and praying for a period of 40 hours. On the second day a mass "for peace" is sung, and it is again placed in the tabernacle after a high mass (that of deposition) has been sung. The exposition is not allowed without leave from the Bishop or without an apostolic indult. Usually no mass is celebrated at the altar during the exposition; the bells are not rung at masses said at other altars. Consult Maier, *Die liturgische Behandlung des Allerheiligsten ausser dem Opfer der heiligen Messe* (Ratisbon, 1860), and Raible, *Der Tabernakel einst und jetzt* (Freiburg, 1908).

EX POST FACTO (Lat., from what is done afterward). A legal term, designating something as done after or arising from or affecting another thing that was committed before. In this broad sense it is applied to the acceptance of an estate by the grantee in a deed, conveying it to him, which estate he had the right to reject or accept. It is also applied to every act of a legislative body, or of a court, having a retroactive effect. The term is most frequently used, however, in a narrower and more technical sense. This is due to certain provisions of our Federal and State constitutions, prohibiting the enactment of ex post facto laws. The term in this connection does not embrace retrospective laws in general, but is confined to laws of a criminal or penal nature. Hence, a statute setting aside a decree of the court of probate rejecting a will and directing a new hearing before the court is not within this constitutional prohibition, however repugnant it may be to the principles of sound legislation. In order to come within the prohibition, the law must render an act punishable, as a crime which was not so when the act was committed or punishable, in a manner in which it was not punishable when it was committed. It is not necessary, however, that the punishment be of a strictly criminal character. A law which excluded a minister of the gospel from the exercise of his clerical functions and a lawyer from practice in the courts unless he would take an oath that he had not engaged in or encouraged armed hostilities against the government of the United States, was declared by the United States Supreme Court to be ex post facto because it punished in a manner not before punishable by law offenses committed before its passage, and because it instituted a new rule of evidence in aid of conviction. On the other hand, a statute is not ex post facto which mitigates instead of increasing punishment, or which changes the rules of evidence or procedure in matters of detail without impairing any substantial right which the law gave the accused at the time when his alleged criminal act was done. In conclusion, it should be remembered that the constitutional provisions in question have always received a liberal construction, with the view of giving full effect to this avowed purpose of protecting the individual right of life and liberty against hostile retrospective legislation. Consult Cooley, *The General Principles of Constitutional Law in the United States* (3d ed., Boston, 1900), and *Kringo* v. *State of Missouri*, 107 United States, 221.

EXPRESS COMPANY. An enterprise which undertakes the transfer of parcels too small or too valuable, or too greatly in need of prompt transmission, to be intrusted directly to the ordinary agencies of transportation. The express company commonly arranges for the collection and the safe delivery of parcels, and their insurance against loss; it may also attend to the collection of their price upon delivery, etc. In the course of their history the express companies became early a chief agency for the transmission of specie and other currency from one financial centre to another. Out of such operations developed a financial branch, including the sale of exchange, the issue of traveler's checks, etc., only loosely allied to the proper field of the express company. The ubiquity of the express service and its responsible financial standing have led to the assumption of yet more remote functions, such as the transfer and placing on record of legal instruments of various kinds.

The express business in the United States came into existence shortly after the appearance of the railway. The earliest-known express service was organized in 1836 by Charles Davenport and N. S. Mason, to operate over the Boston and Taunton Railway. In 1839 William Harnden organized an express service, to operate over railway and steamship lines between New York and Boston. The business grew rapidly in importance, and was extended to transportation between the United States and European countries. Harnden's success excited competition, and in 1840 Alvin Adams organized an express service between New York and New England points. In 1854 Harnden and Adams, with two smaller concerns, joined to establish the Adams Express Company. The American Express Company had already been established, in 1850; and the Wells, Fargo & Co. in 1852, the latter company undertaking especially the lucrative and dangerous business by stage and express riders to the Pacific coast. In 1854 the United States Express was founded, to operate chiefly in the Middle West; the Pacific Express, for southwestern business, in 1879; the Southern Express in 1886, to serve the South east of the Mississippi. Many other companies have been organized, but the ones mentioned include all those that maintained a strong position down to 1912.

The earliest official statistics for all express companies date from 1890. In that year 18 companies were enumerated, operating over a mileage (steam railroads, water lines, and stage lines) of 174,059. The number of employees was 45,718, and the value of equipment owned by the companies was $4,598,567. The gross expenditures exceeded $45,000,000. Receipts were not recorded by the census. In 1907 the number of companies had increased to 34; their operating mileage to 235,903; number of employees to 79,284; value of equipment to $14,014,960; and gross expenses to $115,633,204. The gross receipts amounted to $128,117,176.

The relative magnitude of the four leading express companies is fairly indicated by the following figures for net capital and gross receipts from operation (1912). For the Adams Express the figures are respectively $7,580,813 and $34,191,955; for the American, $9,058,377 and $43,714,874; for the United States Express, $3,948,399 and $21,131,508; and for the Wells, Fargo, $6,227,987 and $32,465,970.

In the early history of the express companies it was not unusual for them to secure cars from the railway companies, paying for their use on a time and haulage basis. With the growth of the business the arrangements between railways and express companies assumed the form of a division of the receipts, the railway company stipulating that express rates should be fixed at a level calculated to preclude direct competition with the freight service. While no uniformity exists in the division of receipts, it has been customary for railway companies to exact 40 per cent of the express receipts for their service of haulage. Where agents of the railway company perform services in hauling express matter, or where the railway stores express matter in its buildings, the share of the railway company in the express receipts may exceed 40 per cent very considerably.

Prior to the Interstate Commerce Act of 1906 the express companies were independent of Federal supervision and control, and fixed rates solely with a view to the general competitive situation. The Act of 1906 extended the jurisdiction of the Interstate Commerce Commission to the express companies. Under authority of the Act the commission prepared forms for annual reports from the companies, which have been published since 1909, and, after thorough examination of the structure of express rates, issued an order, to take effect Feb. 1, 1914, prescribing a new and lower schedule of rates, based upon a zone system.

The natural field of the express service in America lies between the freight service on the one hand and the postal service on the other. By their contracts with the railways the express companies are protected against serious competition from the freight service. Competition with the postal service made its first appearance about 1845, when the express companies conducted a letter express, by which letters were carried for one-quarter of the postal charge. Mr. Wells even proposed to the Post Office Department to take over the whole mail service of the United States. The government, however, established its monopoly by law and reduced its charges for letter carriage, to prevent evasion of the law. The four-pound weight limit upon parcels transmissible through the post office assured the express companies of a monopoly of the transmission of a vast class of small parcels, until Jan. 1, 1912, when an act raising the weight limit of mailable matter went into effect. The express companies remain free to carry parcels in competition with the government, but such competition involves the fixing of a much lower level of charges than had prevailed. In consequence of the loss of profits due to postal competition and lowered rate schedules the United States Express Company decided in 1913 to wind up its business. In 1914 the reports of nearly all express companies made to the Interstate Commerce Commission showed expenditures in excess of receipts. See POST OFFICE; RAILWAYS; PUBLIC UTILITIES, REGULATION OF. Consult Stimson, *Express History* (New York, 1858); Johnson, *American Railway Transportation* (New York, 1903); Special Reports of the Bureau of the Census, *Express Business in the United States, 1907* (Washington, 1908); Atwood, "The Great Express Monopoly," *American Magazine* (New York, February to April, 1912); Interstate Commerce Commission, *Annual Reports of Statistics of Express Companies in the United States* (Washington, 1909-   ).

EXPRESSION, EXPRESSIVE MOVEMENTS. That bodily movements may serve as indexes of mental states is a matter of daily observation. The smiling face, the bright eye, the animated gestures characteristic of joy and pleasantness, contrast sharply with the attitude of dejection which sorrow and grief entail. Experimental methods have shown that even the simplest modes of affective experience, the pleasure of an agreeable odor, the unpleasantness of a discord, are accompanied by measurable alterations of certain physiological functions. There is variation in strength and rate of pulse and respiration, in the flow of blood into the peripheral blood vessels, and in the tonus of the voluntary and involuntary muscles. But it is naturally in the more complex and far-reaching nervous disturbance of the emotion (q.v.) that bodily expression becomes so well marked as to be accessible to external observation.

One of the peculiar features of emotional expression is the seemingly useless and even positively disadvantageous nature of certain of the bodily disturbances. Why should we curl our lip in scorn? Why should we clap our hands for joy, or blush for shame, or tremble for fear? It is in answer to such questions that various authorities have deduced what are called "the principles of expression," with the aim at once of classifying and of explaining the genesis of the expressive movements. The best-known and most important contributions to this subject are those of Darwin, Wundt, and James.

In 1873 Darwin brought forward three principles, by which he hoped to account for most, if not all, of the expressive gestures involuntarily used by man and the lower animals under the influence of the emotions. Darwin's principles are as follows: 1. *The principle of serviceable associated habits.* Many complicated movements which under certain circumstances were of direct or indirect use are retained when their use is no longer apparent, in consequence of the general laws of association, habit, and inheritance. Thus the cat executes peculiar "pawing" movements with the forefeet when it is pleased. These movements are the relic of the purposeful use of the same movements to start or increase the flow of milk from the mammary glands of the mother. The movements became thereby associated with a pleasurable and satisfied consciousness, and tend to recur whenever such a consciousness recurs. Wundt considers that this principle is but a special case of Darwin's third, the direct action of the nervous system; for the overflow of nervous energy takes those paths which are habitual and most frequently used. 2. *The principle of antithesis.* As Darwin explains it, "every movement which we have voluntarily performed throughout our lives has required the action of certain muscles; and when we have performed a directly opposite movement, an opposite set of muscles has been habitually brought into play. . . . So when actions of one kind have become firmly associated with any sensation or emotion, it appears natural that actions of a directly opposite kind, though of no use, should be unconsciously performed through habit and association under the influence of a directly opposite sensation or emotion." Thus, impotence is expressed by raised eyebrows, shrugged shoulders, and open palms; since these are the antithesis of the frowning brow, the thrown-back shoulders, and the clenched fists, symbolic of rage and power. James says in comment: "No doubt a certain number of movements can be formulated under this law; but whether it expresses a *causal* principle is more doubtful. It has been by most critics considered the least successful of Darwin's speculations on this subject." 3. *The principle of the direct action of the nervous system;* or of actions due to the constitution of the nervous system, independent from the first of the will and independent to a certain extent of habit. The sudden release of large quantities of nervous energy demands unusual outlet from the central nervous system. This overflow takes place according to the preformed connections of the nervous elements. Its results are visible in the general disturbance of organic function due to the exciting or inhibitory effects of these irradiations of energy from the central nervous system. On this principle are explained such phenomena as the muscular tremors of fear or of great joy; the increased glandular activity of the liver, kidneys, and mammæ; the alterations in cardiac and vasomotor functions; and such movements as the clapping of the hands for joy. It is admitted by James, and is practically identical with the first principle of Wundt.

Wundt's principles are likewise three in number: 1. *The principle of direct change of innervation.* This is but a different wording of what we have just discussed as the third principle of Darwin. It involves the principle of the hereditary transmission of certain nervous connections; thus, the reflex of weeping, which probably falls in origin under the third principle, has by inheritance come to take its place under the first. The transmission of a characteristic family physiognomy or general expressive attitude is very common; and we invariably argue from the physical similarity to a similarity of mood, even though there be no possibility of imitation of the parents by the children. These direct changes in innervation are almost always accompanied by a noticeable reactionary effect upon the ideational course of the emotion. The frightened man stutters, not merely because his tongue mechanically refuses service, but also because his thoughts are really brought to a standstill. 2. *The principle of the association of analogous sensations* is based upon the fact that sensations of similar feeling tone easily associate and reënforce one another. This process forms the basis of the most characteristic of all emotive expressions, the "mimetic movements." These are physiologically conditioned by reflex movements in and about the facial sense organs; thus the expression which stands for "bitter" is an arrangement of the parts of the buccal cavity most sensitive to bitter in such a way as to prevent their excessive stimulation by the unpleasant taste. The "sweet" expression, on the contrary, is that calculated to favor the continued stimulation of the tip of the tongue, the part most sensitive to sweet substances. By virtue of the second principle these reactions have come to appear in response not only to an actually bitter taste, but also to an emotional condition which possesses the same general feeling tone. So the expression has become symbolic. A wry face may denote a mental as well as a physical pain. 3. *The principle of the connection of movement with sense ideas* explains all the facial expressions and gestures which are not included under the two previous principles. Here belong the "pantomimic movements" (such as pointing, and the imitative representation, by movements of arms and hands, of the object which arouses the feeling), the clenching of the fists in anger, and also certain facial expressions, such as the curling of the lip in scorn and the staring eyes of surprise. The principle seems closely allied to Darwin's first. It is not to be thought that any complex expression of emotion must be explained by a single principle. Such phenomena as laughing and weeping demand the use of all three principles for their elucidation.

James proposes the five following principles: 1. *The weakened repetition of movements which formerly were of utility to the subject.* This is equivalent to Darwin's first proposition. 2. *The principle of reacting similarly to analogous-feeling stimuli.* This is identical with Wundt's second principle. 3. *The principle of weakened repetition of movements which under other conditions were physiologically necessary effects.* The respiratory disturbances of anger and fear, e.g., may be considered as "organic reminiscences . . . of the blowings of the man making a series of combative efforts, of the pantings of one in precipitate flight." 4. *The principle of the mechanically determined idiopathic effects of the stimulus,* i.e., the physiological outpourings of excess of nervous energy through the easiest drainage channels (cf. Wundt's first and Darwin's third law). 5. *The principle of the mechanical perpetuation of emotional reactions which may be called accidental as far as their origin goes.* For some of our emotional reactions no plausible reason can be conceived. "In fact, in an organism as complex as the nervous system there must be many such reactions, incidental to others evolved for utility's sake, which would never themselves have been evolved independently, for any utility they might possess." In conclusion it may be said that no one of these explanatory series of principles is logically complete. There is need of further observation, and perhaps of a new construction of principles upon the basis of the psychology of action (q.v.). Consult: Darwin, *The Expression of the Emotions in Man and Animals* (London, 1890); Wundt, *Grundzüge der physiologischen Psychologie* (Leipzig, 1911) and *Völkerpsychologie* (ib., 1900); James, *Principles of Psychology* (New York, 1890); Titchener, *Primer of Psychology* (ib., 1909). See GESTURE.

EXPUL'SION (Lat. *expulsio*, from *expellere*, to drive out, from *ex*, out + *pellere*, to drive). The act of removing one from the possession of real property, or from an office, or from membership in a body or association, or of depriving him of a right, privilege, or license. Expulsion of the first sort is called eviction (q.v.). The manner in which a public officer may be expelled or removed is generally regulated in this country by constitutional or legislative provision. For example, the Federal Constitution secures to each House of Congress the power to expel a member with the concurrence of two-thirds. In the exercise of this authority it may proceed summarily and need not observe the formalities of judicial procedure. Nor does any appeal lie from its decision. The same Constitution secures to Federal judges both of the supreme and inferior courts tenure of office during good behavior. Recently many statutes have been passed by Congress and by State legislatures limiting or qualifying the power of removing persons from office in certain lines of the civil service (q.v.).

Members of a corporation may be expelled in certain cases, as where they have been convicted of an infamous crime or have been guilty of some corrupt or dishonorable conduct in connection with the affairs of the corporation. A partner cannot be lawfully expelled from his firm unless the partnership contract expressly authorizes expulsion. In such a case, as well as in all other cases of unincorporated associations, the member proceeded against is entitled to notice of charges and an opportunity to defend himself as well as to a fair and impartial decision. See CLUB.

Persons who are not members of a public body or of a private corporation or association may be expelled from its meetings at any time. Even though their attendance has been induced by an authorized invitation, the license or privilege may be withdrawn at any moment; and if they refuse to leave they may be forcibly removed. The same rule holds good in the case of other meetings. Those who convene them have the right to expel objectionable persons, provided they use no more force than is necessary for that purpose. Consult Thompson, *Commentaries on the Law of Private Corporations* (2d ed., 7 vols., Indianapolis, 1908–10), and Pollock, *Treatise on the Law of Torts* (9th ed., London, 1912).

EXTENDED ORDER. The formation in which the units are separated by intervals greater than in *close order*. The purpose of extended order drill is to teach the mechanism of deployment, of the firings, and, in general, of the employment of troops in combat. Such drills are executed at ease. The company is the largest unit which executes extended order drill. Consult *United States Army Infantry Drill Regulations* (Washington, 1911). See INFANTRY; TACTICS, MILITARY.

EXTENSION, IN LOGIC. See DENOTATION.

EXTENSION, EXTENT (Lat. *extensio*, from *extendere*, to stretch out, from *ex*, out + *tendere*, to stretch). The simplest spatial determination of mental processes, as duration (q.v.) is their simplest temporal determination. Not all psychologists are agreed upon the existence of extent as an intrinsic attribute of sensation; but for the present purpose we may provisionally assume that extent, in the sense of "spreadoutness," is a characteristic feature, at least, of visual and cutaneous sensations. The validity of this assumption will be discussed later. Of the psychological problems concerned with spatial relations, the majority, such as the perception of form, of distance, position, order, arrangement, the geometrical-optical illusions, etc., take us beyond the treatment of extent as an attribute of sensation. Within the sphere of sensation there are theoretically three problems to be solved: (1) that of the smallest noticeable extent; (2) that of the largest noticeable extent; and (3) that of the just noticeable difference of extents, or the sensible discrimination (q.v.) for extent. These problems must be attacked in the sphere both of visual and of haptical sensations, though the latter are, for practical reasons, limited to a single quality, pressure.

The second question is at once the least important theoretically and the least difficult of solution. Maximal extent of pressure may be obtained, e.g., by immersion of the entire body in water. The "maximum visibile" is obviously measured by the total area of the "field of vision." This embraces for a single eye a region delimited by the following angles (based upon the straight line joining the centre of the pupil with the centre of the "yellow spot"): outward, 70°–85°; inward, 60°–50°; upward, 45°–55°; downward 65°. Hence the maximal field is, for a single eye, an oval measured by a visual angle of 130°–135° horizontally and 110°–120° vertically.

The first problem, that of the smallest noticeable extent, brings us to the well-worn question of the "minimum visibile." Two factors must be constantly regarded: 1. In the neighborhood of the stimulus limen, extent and intensity play into each other's hands. An imperceptibly small area may become perceptible with increased illumination; an imperceptible degree of illumination may become perceptible with an increase in its area. 2. Owing to the error of dispersion (diffusion of stimulation upon the retina), the extent of the object used as a stimulus may not correctly indicate the extent of the stimulated portion of the eye. In the method of Helmholtz the least noticeable visual extent is determined by approximating two luminous points or lines placed at a constant distance from the eye and recording the limit (expressed by the visual angle or the distance between the two retinal images) at which they are just distinguishable. The *keenness of vision*, thus measured, varies with the part of the retina stimulated; it is greatest at the fovea (where an angular difference of about 1 minute of arc, or a distance between images of 0.004 mm., is just perceptible) and falls to 1/100 of this maximal capacity at 30° to 40° from the fovea. More recent determinations, excluding the error of dispersion, indicate that a lateral displacement in the relative position of two vertical, end-on-end lines is detected when the visual angle is but 7 seconds of arc. Hence, it is argued, the "minimum visibile" is distinctly smaller (0.0005 mm.) than the diameter of a single cone (estimated at from 0.0015 to 0.0044 mm.). But it is doubtful whether these figures, expressing as they do the limen for separation of points, give us any indication of the least visible extent; any more than the least distance for the cutaneous discrimination of two points can be regarded as the least perceptible cutaneous extent. The judgment of two lines or two points does not necessarily carry with it any reference to space. We shall do better, perhaps, to consider the retinal cone as affording the unit of visual extent; although, as is shown later in this article, a limited extent may be less, under certain conditions, than the diameter of a single cone. The limen is further dependent upon the quality of the stimulus. Thus, the space limen for colors must be expressed in terms of three values: (1) the achromatic limen, at which light appears; (2) the chromatic limen, at which color of any sort is seen; and (3) the "characteristic" limen, at which the actual color tone of the stimulus is perceptible; though, in certain cases, two or even all three of these limens may coincide.

We may regard the pressure spot as the unit of cutaneous extent, as the retinal cone is that of visual extent. The limen of pressure separation, falsely assumed to be identical with the liminal extent, was first investigated by E. H. Weber. Weber's results show clearly the dependence of the limen of separation upon the place stimulated. The following values, taken from his classical table, illustrate this point: tip of tongue, 1 mm.; tip of finger, 2 mm.; cheek, 11 mm.; forehead, 23 mm.; middle of back, 68 mm. By the stimulation of individual pressure spots much lower values have been found: chin, 0.3 mm.; cheek, 0.4 mm.; forehead, 0.7 mm.; back, 5.0 mm. Subsequent work upon æsthesiometry, or "Weber's sensory circles," as these experiments are called, has emphasized the law of Vierordt that the space limen at any point in the length of a limb is inversely proportional to the distance of the stimulated part from the axis of rotation, and has called attention to the increase of the limen of separation with fatigue—an increase so characteristic as to be urged by certain investigators as a practical test for degree of general fatigue. See Fatigue.

The third problem, discriminability, is termed in the sphere of vision "eye measurement." The results of many investigations made are often different, since they depend upon many factors difficult of isolation even under experimental conditions. These factors are eye movement, the quality of the compared extents (see under Illusion), their absolute length, their distance from the eye, their direction (vertical, horizontal, etc.), the use of monocular or binocular vision, etc. Running the eyes along the lines, i.e., the introduction of the strain sensations set up in the eye muscles, appears to aid discrimination of linear extent. When we estimate extent in this way, i.e., partly in terms of intensity, the relative difference limen is approximately constant at 1/50; two lines seem different if one is 1/50 longer or shorter than the other. Recent work has demonstrated that, with the resting eye, one can discriminate at least four different extents, all of which fall within the limits of a single retinal cone, although the actual basis of this discrimination is the quantity of light which falls upon the cone. The discrimination of tactual, like that of visual, extents is complicated by extraneous factors; arm-movement measurements involve the factors of the duration and intensity of strain sensations, while in cutaneous experiments proper it is difficult to exclude judgments couched in visual terms. Two circular surfaces applied to the tip of the tongue may be recognized as different when their diameters are no more than 0.5 mm. and 1 mm.; but on the back they must be 2 mm. and 25 mm. respectively. Cold surfaces appear larger than warm surfaces of equal size.

Our provisional assumption posited extent as an ultimate property of certain sensation systems, as irreducible and unanalyzable as quality or intensity. This view regards the perception of depth and all other spatial relations as derivative products of associations formed by experience. Thus, the quasi-spatial nature of certain sense qualities, e.g., the seeming differences in the "bigness" of sounds, does not demand the assumption of any elementary spatial attribute in these sensations. It remains to be pointed out that this view of extent has not gained universal acceptance. At the one extreme certain psychologists, notably Wundt, seek to derive all spatial determinations of mental processes from other nonspatial contents of consciousness. (See Fusion.) They do not, therefore, postulate a special attribute for any sensation system. At the other extreme certain psychologists, of whom James may be considered typical, ascribe an elementary spatial attribute not only to visual and cutaneous but to all sensations. James prefers the term "voluminousness." "This element, discernible in every sensation, though more developed in some than in others, is the original sensation of space. . . . This 'vastness' is as great in one direction as another. Its dimensions are so vague that in it there is no question as yet of surface as opposed to depth; 'volume' being the best short name for the sensation in question." From the psychological standpoint the merit of these three positions can be adjudicated only upon the verdict of trained introspection as aided by the experimental method. The principle of parsimony must incline us to the simplest consistent theory. From this point of view the merit appears to lie with those who maintain the middle position, though from the genetic side the Wundtian explanation is, perhaps, the most satisfactory. In other words, we may consider that the adult human consciousness is unable by introspection to get behind extent of "spreadoutness" as an ultimate datum of experience, although we may construct a theory of its genesis from other, simpler, nonspatial processes.

Consult: Külpe, *Outlines of Psychology* (London, 1909); James, *Principles of Psychology* (New York, 1890); Titchener, *Text-Book of Psychology* (ib., 1910); Wundt, *Grundzüge der physiologischen Psychologie* (Leipzig, 1908–11); id., *Introduction to Psychology* (London, 1912).

EXTERIOR BALLISTICS. See Ballistics.

EXTERRITORIALITY. The fiction or rule of law by which certain classes of aliens in a country are more or less exempted from its jurisdiction and are governed by the laws of their own country. The right to this exemption is not absolute, but arises from, and is made possible by, the comity of nations; and the reasons for its existence are to be found partly in the survival of ancient laws, partly in reasons of state, and partly in the purpose of protecting the citizens of civilized nations against the unsuitable laws of more barbarous countries.

Entrance into a country, on which the privileges of exterritoriality are based, may be suspended or entirely refused (see Alien); as, e.g., the entrance of a foreign sovereign or prince may be prohibited for reasons of state, or of foreign armed ships or armies.

The privileges arising from exterritoriality are extended particularly to sovereigns, diplomatic agents, especially ambassadors and their suites, family, and servants, and to public armed vessels and armies in permitted transit. The person of a sovereign traveling in a foreign country is inviolate, and he is exempt from the law of the land; but he has no greater powers than he would have at home and has no authority over any except his own subjects who form part of his suite, retinue, or servants. This privilege does not at any time extend, either in the case of sovereigns or any other, so as to exempt from the local laws any property, real or personal, belonging to such person except the effects brought with him. Public armed vessels are to be distinguished from vessels of private citizens. Although the latter, so long as they are upon the high seas, remain fully subject to the jurisdiction of their own country, whenever they enter within the waters of a foreign country they become, with all on board, subject to the laws of the country within whose waters they are as fully as if ashore. A public armed vessel, however, and vessels chartered to convey a sovereign or his representatives, continue subject, with their crews, to the law of their own country. When ashore, the crew become subject to the local administrative law, and, if guilty of aggression or hostility, can be arrested forcibly if necessary, and punished according to the law affecting the aggression committed. Such transgressions expose the guilty persons not only to arrest and trial, but to complaint to their own sovereigns. The public vessel, however, may not exceed the privileges extended to it on account of its character, nor exercise other rights which it would have on the high seas, such as committing an act of war, or the capture of foreign vessels while within the waters of a foreign state. The permission to an army to go through a foreign country carries with it the right to maintain its discipline and do all other things connected with the passage of the troops which may be necessary to maintain the integrity of the army during its passage. This may extend to the purchase of provisions, but will not excuse crimes or breaches of the public law of the land. The permission is rarely extended; and when it is, it is usually by treaty. The privileges extended to an ambassador or other diplomatic agent arise partly from the consideration that they are essential to the proper conduct of the business intrusted to him and partly from considerations of respect to the foreign sovereignty represented. They begin when he enters the country and continue till his departure, or until a reasonable opportunity for it has elapsed. See DIPLOMATIC AGENTS.

Analogous to these privileges arising out of the comity of nations are those which are secured by treaty for foreigners from Christian lands in certain Oriental countries, where the prevailing laws and usages are unlike those of Christendom, or are so barbarous that there is reason to fear that justice will not be done, or that it will be administered in such a manner as not to protect life, limb, and property according to the standards of civilization existing in Christendom. By treaties between the United States and China, Korea, Borneo, Madagascar, Persia, Turkey, Samoa, Siam, Zanzibar, and Tonga, the citizens of the United States are more or less fully exempted from local jurisdiction and are allowed to remain under the jurisdiction of the United States. Formerly the United States had such a treaty with Japan; but when that nation attained the dignity of a great power, the treaty was abrogated. See CONSUL. Consult: Woolsey, *Introduction to the Study of International Law* (7th ed., New York, 1902); Phillimore, *Commentaries on International Law* (London, 1889); the authorities referred to under CONSUL, MERCANTILE; DIPLOMATIC AGENTS; INTERNATIONAL LAW; ETC.

EXTINCT ANIMALS. Extinct animals, as the term is used in the present article, means those whose species have been exterminated since the advent of man upon the earth, and in most cases, as a matter of fact, by his agency, directly or indirectly. It is not to be presumed that a complete list of species so exterminated could be given, since many, no doubt, completely disappeared before any sort of record began. Others, as we know or suspect, survived into the era of prehistoric man, but not later. Many species, however, have disappeared, not only since written records began, but within the past century or even within the memory of men now living; and it is these which will demand most attention.

Exterminating Influences. The causes of the disappearance noted arise from man's varied utilization of nature for his benefit or pleasure. Directly, he destroys animals (1) for the sake of their flesh as food, or of their skins as clothing, bedding, or shelter, and for various utilizations of other parts and products; (2) because they may be dangerous to his life or troublesome to his enterprises or comfort; (3) in sport; (4) by domestication. Indirectly animals suffer, sometimes to the extinction of their species, by man's clearing of the forests, draining of marshes, burning over areas by prairie and forest fires, damming or divergence of rivers, fencing in and cultivation of the ground, thus destroying pasturage and other food, limiting movement, and in many ways interfering with animal methods and means of obtaining a livelihood. Another potent influence is man's turning loose upon wild life new enemies in the shape of his domestic dogs, cats, rats, goats, or hogs, or of introduced exotic animals, all of which, intentionally or otherwise, are injurious to some or many wild creatures, and in some instances have been the principal agent in the extermination of lost forms. Many minor circumstances have contributed to the depletion or disappearance of animals in all the more civilized parts of the earth; and it must be remembered that the extinction of any species has a distinct effect upon some or many others. Thus, the removal of the herbivorous quadrupeds from a region would result in death by starvation of all the larger carnivores of that region.

Extermination of Animals by Prehistoric Men. Just how far we are to attribute to the direct agency of primitive man the extinction of forms that evidently survived until after his advent upon the earth must be a matter largely of opinion. There seems good reason to suppose that the last of various species of moalike birds were destroyed by the primitive inhabitants of New Zealand and Madagascar; but there is a fair possibility that the cold of the Glacial period is wholly responsible for the end of a group that no doubt was waning. The same remarks apply to the mammoth and mastodon. That man was contemporary with the last of the mammoths in southern Europe seems indubitable; that the American mastodon was ever seen alive by human eyes is, on the other hand, very doubtful. At any rate, the termination of their career over the vast areas of the northern half of our hemisphere cannot be attributed to human hands. Paleolithic man probably hunted not only the mammoth, but several other animals whose early extinction may have been hastened in southern Europe, such as the huge sabre-toothed tigers (*Machærodus*), the ancient grizzly and brown bear, the larger varieties of the lion and spotted and striped hyenas, the woolly rhinoceros (*Rhinoceros tichorinus*) and related species, and various smaller animals long extinct. Some of these were northern, like the musk ox, reindeer, Arctic fox, etc.; others southern, like the African elephant and hippopotamus. In the changes of climate which accompanied and followed the Glacial period these and other species disappeared from southern Europe, to survive, if at all, only in the north or in Africa, as their adaptations required. Certain species we know or may feel sure survived until destroyed by mankind. Such was the case with the great-horned Irish deer (see DEER; ELK), which assuredly survived until the close of the Bronze age. The two most interesting instances of prehistoric extermination, however, are those of the horse and the camel. The wild stock of neither of these has been certainly known within historic times. How long it may have survived in Asia or northern Africa we have no present means of knowing; still less of answering the question whether any indigenous horse was contemporary with early man in South America. Much evidence exists, however, of the presence of native horses in Europe well on into the Neolithic period of human settlement there. They were hunted and killed mainly for food, no doubt, but seem to some extent to have been domesticated. Just how long they lasted is uncertain, but it seems indubitable that man is responsible for their ultimate extinction. Whether, at some earlier period, a separate species of dog, the founder of the races of domestic dogs, ever existed, or if so was exterminated after partial domestication by man, is purely conjectural. (See DOG.) The saiga was killed off in southwestern Europe prehistorically, but has survived eastward.

Extermination in the Old World within Historic Times. Since written records began, several species have vanished from the fauna of Europe, but remain elsewhere, or are preserved in carefully guarded remnants. The lion, tiger, leopard, and various wild cats once inhabited the valley of the Danube, and the lion was common there in Roman times. When the Romans first penetrated central and western Europe, they found numerous not only the "bonasus," which we now mistakenly call the aurochs, but a race of great wild cattle. Mere remnants of these (see BISON; CATTLE) remain in a more or less impure condition on private preserves. The native roe and fallow deer (qq.v.) would long ago have perished had they not been protected and bred in parks and hunting forests. The chamois of the Alps survives only under legal protection, which has not sufficed to keep the ibex, now utterly extinct. The same might be said of certain lesser animals. Brown bears existed in Scotland up to the time of Edward the Confessor, but not later, and the last reindeer disappeared from Caithness about the same time. The beaver probably remained in Scotland and Wales until the thirteenth century. Wild boars were hunted until the end of the seventeenth century, and the wolf eluded his doom much longer, the last one being killed in England during the reign of Henry VIII, in Scotland in 1740, and in Ireland in 1775.

Asia furnishes few or no examples of animal extinction of importance since written records began, with the exception of the rhytina and a cormorant, both of which once dwelt on islands off the coast of Kamchatka. The rhytina was a sea cow, closely related to the manatee (q.v.), but much larger, which was confined to the Commander Islands in Bering Sea, where it was discovered by the expedition of Bering, which was wrecked there in 1741. During the next 20 years these islands were constantly visited by seal and fur hunters, who slaughtered the animals to obtain their beeflike flesh. It has been estimated by Stejneger (*American Naturalist*, vol. xxii, Philadelphia, 1887), who made local investigations, that not more than 3000 rhytinas herded there altogether, and the last one was killed about 1768. In the same island group, and nowhere else, there dwelt a very large but small-winged cormorant (q.v.), called Pallas's, after the Russian naturalist, its first describer. It was stupid and slow in its movements, furnished excellent flesh, and although a few survived the occasional visits of hungry sea hunters until 1839, at least, the end then came.

Liability of Insular Faunas to Destruction. The examples just recounted illustrate many cases in which inhabitants of small islands have succumbed to changes in their limited circumstances. Thus, the New Zealand group has lost several birds which were either confined to isolated and limited places or were helpless to escape from European colonists. A certain quail (*Coturnix*) and the owl parrot (*Nestor*) are gone; and of two species of kaka parrots (*Nestor productus* and *norfolkensis*) none remains upon either Philip or Norfolk Island, where they abounded respectively previous to 1850. Several other Australasian species which spend their lives upon the ground are weak of flight and, unaccustomed to such enemies, are rapidly disappearing under persecution by rats and by imported ferrets, weasels, etc., introduced by the English settlers in an unwise attempt to subdue the plague of rabbits, which they had previously "acclimatized." One of the forms most threatened are the curious flightless weka (q.v.) rails, of which closely allied species once existed on Norfolk Island, on Lord Howe Island, and on one of the Chatham Islands. Dixon quotes Dr. Forbes in the statement that 17 species of birds that formerly lived on Chatham Islands have become extinct. The civilization of the Sandwich Islands has led to the destruction of several birds, one of which, the mamo (q.v.), was sought for the sake of its rich yellow feathers, used as an ornament of the cloaks of the chiefs, until none remained; another, related to the wattle crows, succumbed to the clearing of certain brushy woods by cattle and goats. Tahiti seems to have lost utterly a certain rail (*Prosobonia leucoptera*) and Latham's white-winged sandpiper (*Hypotænidia pacifica*); and another shore bird (*Æchmorynchus*) has died out in the Christmas Island group.

The most conspicuous examples of island birds extinguished since white men discovered their isolated homes are afforded, however, by Mauritius and the neighboring islands of the Indian Ocean. Mauritius, when rediscovered by the Dutch at the end of the sixteenth century, was inhabited by that singular and inept bird the dodo (q.v.), relations of which (see SOLITAIRE) have perished likewise in the islands of Réunion and Rodriguez. In Mauritius, besides the dodo, at least two species of parrot, a dove, a large coot, and a second ralline bird, abnormally flightless and long-billed, called *Aphanapteryx*, have become extinct. Réunion, also, once had other birds now lost, and so had Rodriguez. In Réunion, a somewhat abnormal starling, *Fregilupus*, existed until about 1850, while from Rodriguez the greater part of its original avifauna has vanished. There were a small but peculiar owl (*Athene murivora*), a big parrot (*Necropsittacus rodericanus*), a dove (*Erythræna*, sp. ign.), a large brevipennate heron

(*Ardea megacephala*), and a singular rail, besides other birds of which we know from the old voyagers.

The destruction of bird life in these islands was due not only to direct chase by man, but indirectly to the introduction of domestic or other animals. The hogs let loose in the Mascarene Islands finished the dodos and their relatives, and rats have done great mischief in Oceanica. Fires, too, have burned the coverts, destroyed nests and eggs, and killed much or all of the food of many species by consuming reptiles, insects, mollusks, worms, etc., great numbers of species of which are also to be counted among the animals recently extinct. This agency was especially potent in the Antilles.

The turtle tribe presents a parallel case of extinction in the island-inhabiting species of gigantic tortoise (q.v.)—isolated survivors of forms widespread during the later Tertiary age. During the historic period various species of these gigantic tortoises have been numerous on the Mascarene Islands, on Aldabara, a small island northwest of Madagascar, and on the Galápagos Islands, west of South America. At the end of the seventeenth century they existed by thousands in Mauritius (three species), Rodriguez (one species), and Réunion (one species). In Mauritius they were still abundant until about 1750, when they became so scarce that importations from Rodriguez were made by the shipload, as food for the garrison; and the continuance of these supplies (also sent to the Seychelles), together with the constant destruction of the eggs, exhausted the stock of tortoises about the end of the eighteenth century. Those of Réunion had vanished long before; and a single aged captive at Saint-Louis, Mauritius, still alive in 1895, at an age probably approaching 200 years, is the sole survivor of the great herds of Rodriguez. Aldabara had originally four species, only one of which, the elephant tortoise, survives and is very scarce. The Galápagos possessed several species, all good for food, and now destroyed with the exception of a few on Albemarle Island and about 100 specimens living in various zoölogical gardens. See Tortoise.

Africa has been the scene of extraordinarily rapid changes in faunal characteristics during the last century, and its later decades have witnessed the extermination as wild game, if not absolutely, of many of the largest and finest quadrupeds in its list. The herds of elephants, buffaloes, antelopes, and other grazers which thronged upon the plains and in the forests of South and Central Africa when Europeans began to colonize there, were past counting.

This wealth of game was ruthlessly destroyed by Arab and Portuguese traders and Dutch farmers, and then by English and German sportsmen, settlers, and hide hunters—the last the worst agents of destruction, as has been the case in America. The result has been the depletion of game throughout all the more open regions, until now many species, exceedingly numerous previous to 1850, have become rare, and obtainable only in remote districts, while several species of the finest of African quadrupeds have totally vanished. One of these is the square-mouthed rhinoceros (*Rhinoceros simus*), none of which has been seen for several years. Another lost species, and one greatly to be regretted, is the true quagga (*Equus quagga*), a magnificent wild horse which originally roamed over South Africa, but was killed off by the Boers, first as food for their black servants, and later for the hides, until it utterly disappeared by 1875 or 1880. An even earlier date had witnessed the extermination of the true or mountain zebra (q.v.), which lingered somewhat longer in the Abyssinian interior, but seems now entirely gone. Several of the larger antelopes have met or seem about to share the fate of these lost horses. The eland has been nearly extirpated by Dutch hide hunters. The blaubok (*Hippotragus leucophæus*) has long been extinct, and its relatives the magnificent sable and roan antelopes (qq.v.) are growing rare; the white-tailed gnu (q.v.) is on the verge of extinction, except for a few preserved as captives; the bontebok and blesbok (qq.v.) are rapidly approaching the same fate; and the giraffe, on account of its incessant persecution by men in search of its valuable hide, remains numerous only in the remote waterless regions of the northern Kalahari Desert. A monkey (*Colobus kirki*) of limited distribution on the West Coast and the island of Zanzibar is now supposed to be extinct. See Hartbeest.

Extermination in America. The list of the larger animals lost to America since its rediscovery and settlement by Europeans is a long one. Whether or not a native horse lingered in small numbers in South America is a matter of dispute. If there was such an animal, it so quickly disappeared and was replaced by herds of escaped Spanish horses as to have left no trace of itself. The story of the extermination of the bison, of which the only remaining wild remnant at the opening of the twentieth century was a herd of about 250 in the forests north of the North Saskatchewan, is familiar to most readers. (See Bison.) Several marine mammals of our shore have suffered or are doomed to speedy extinction. The case of the rhytina of Bering Sea has been noticed. Its relative, the manatee, is all but extinct in Florida and rare elsewhere. The fur seal of the North Pacific (see Seal) seems likely to die out within a few years, as also does the walrus, now wholly Arctic, except in the neighborhood of Bering Strait. There formerly existed in great numbers along the Californian coast a local sea elephant (see Elephant Seal) which until about 1850 furnished profitable sealing. A herd of about 150 individuals on the small island of Guadaloupe, off Lower California, represents all that is left of this species. The few elephant seals still remaining about Cape Horn and small isolated South Pacific islands, represent an expiring race. The West Indian monk seal (*Monachus tropicalis*), once common around the Gulf of Mexico and the Caribbean Sea, had been mainly killed off by 1850, and since then has lingered only on a small group of islets, the Triangles, north of Yucatan, where an accident may easily put an end to the small band.

In respect to birds the New World has suffered much loss by the changes incident to civilization. The best-known case, perhaps, is that of the great auk (see Garefowl), which was literally hunted off the face of the earth. It should be said, however, as in several other cases, that this species had a very limited distribution and was waning. Its migrations once extended southward along the west coast of Great Britain to the Bay of Biscay in Europe, and in America southward to Cape Hatteras. Evidence of this is derived from finding its bones in prehistoric shell heaps along the coast. It seems to have occasionally visited Norway, but it never was an Arctic bird. Its extermination was no doubt largely effected prehistorically, for within the time of records it has rarely been known to visit even the Hebrides, and its breeding places were few. It had bred abundantly from time immemorial on the Garefowl Skerries, off the southwest coast of Iceland, and might have remained there yet, had not a volcanic disturbance in 1830 destroyed the islets. The survivors fled to Eldey Island; but as this was more accessible, the colony was raided repeatedly by fishermen, and in 1844 the last pair of auks was killed. This ended the history of the garefowl in Europe. How long certain Greenland colonies lasted is not known. In 1534 the men sailing with Jacques Cartier to the discovery of the St. Lawrence River found on Funk Island, off Cape Bonavista, on the northeastern coast of Newfoundland, a resort of these and other sea birds, where the "penguins" (for this term was first applied to this species and later transferred to the Spheniscidæ) were breeding in thousands. The indiscriminate slaughter of these birds came to an end at an uncertain time, probably about 1840. According to a list published in England in 1888, 79 skins were known to exist, with 10 skeletons and 68 eggs. A third of these are preserved in public museums in various parts of the world, and the remainder are privately owned. When by chance these remains are sold, very high and rapidly increasing prices are paid. At a notable auction sale of an ornithological collection in London in 1895, one skin in excellent condition was sold for 360 guineas (about $1800), and an egg brought 180 guineas (about $900). A very complete account of the history of the great auk, together with a full bibliography, may be found in F. A. Lucas's account of his expedition to Funk Island, in 1887, to recover relics of the bird, published in the *Annual Report of the Smithsonian Institution for 1888*.

The next most conspicuous instance of the loss of an American species of bird is the case of the wild or "passenger" pigeon, which within the last half of the nineteenth century disappeared (but not completely), in a manner not easily accounted for, from a great region in the central United States where previously it had been surpassingly numerous. Its history will be found in the article PIGEON. The Eastern pinnated grouse (see article GROUSE) survives only in few examples on Martha's Vineyard, which, in spite of legal protection, seem destined to early extinction by semiwild house cats. The Carolina parrakeet (q.v.) is a small parrot once very common throughout the lower Mississippi valley, now to be found (if at all) only in a few remote swamps of the Gulf coast; and the large Cuban macaw (*Ara tricolor*) is wholly extinct. Another bird of that region, the ivory-billed woodpecker (q.v.), is probably wholly gone. It is believed that the Antilles and lesser of the West Indian islands have been deprived of many species of birds and other animals since they were first colonized, because recent collectors have been unable to find several species described by early writers, and others have become extremely rare. Newton mentions the loss of a species of petrel (*Æstrelata hæsitata*) of Dominica killed off by a carnivorous marsupial unintentionally introduced into that island; and the mongoose (q.v.) is extirpating a related petrel in Jamaica. Finally, the California condor (q.v.) has been added most lately to the list of vanishing American birds, only a few pairs remaining, in the mountains of Southern California.

For the decrease or disappearance of certain fishes, see FISHERIES; FISH CULTURE.

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EXTINCT BIRDS. Various birds may be called "extinct" instead of "fossil," because their species have expired since the present geological era began, or, in several cases, since written records began to be made. In most cases these were birds that belonged to ancient and senescent races, such as the ratite moas (q.v.) and their kindred; or they were species of extremely limited range, or of degenerate powers, due to an insular habitat or other unfavorable surroundings. Consult Rothschild, *Extinct Birds* (London, 1907). See EXTINCT ANIMALS.

EXTINCTION OF SPECIES. The extinction of species and higher groups has been due to two causes—first, changes in the physical geography and other environmental conditions of the globe during past geological time, and, second, to changes in the biological environment.

Geological Extinction. The primary factor, therefore, in the extinction as well as the origin of life forms is geological changes. If we glance back through the geological ages, we shall see that there were instances of the comparatively rapid extinction of types or whole groups (orders and classes) of animals. The more remarkable were the death and disappearance of the trilobites and ammonites. Darwin remarks: "The extermination of whole groups, as of ammonites towards the close of the Secondary period, has been wonderfully sudden." The trilobites as well as the important order of Eurypterida ceased to exist at the end of the Paleozoic era; the Silurian graptolites, that very considerable group of hydroids, disappeared with comparative suddenness. Coming down to the Mesozoic age, there was a remarkable extinction of types. The greater number of crinoids and brachiopods, and all the dinosaurs and ornithosaurs, as well as the pythonomorphs, these groups comprising the most highly organized reptiles which have ever lived, wholly perished towards or at the close of the Cretaceous period.

It should be borne in mind that these facts of comparatively rapid extinction have nothing in common with the Cuvierian catastrophic doctrine of sudden wholesale extinctions and recreations. But known facts of geology postulate long periods of quiet preparation, succeeded by more or less sudden crises, or radical changes in the physical structure of continents, resulting in catastrophes, both local and general, to certain faunas or groups of animals as well as individual species. These so-called catastrophes, though geologically sudden, may have required thousands of years for accomplishment.

There have been in the course of the earth's history a number of crises or revolutions which were attended with the loss and extinction of types.

There were enormous changes in the relative distribution of land and sea in pre-Cambrian times. The strata of the Lower and Upper Huronian are unconformable to each other, the Keweenawan beds are unconformable to the Huronian. Between each two series is an unconformity representing an interval of time long enough for the land to have been raised above the seas, for the rocks to have been folded and to have lost by erosion thousands of feet, and for the land to have sunk below the surface of the ocean. Again, between the pre-Cambrian and Cambrian eras there was a great uplifting and folding of rock, succeeded by long-sustained erosion, over all the continental era.

At the end of the Paleozoic era occurred the Appalachian revolution. This was a period of mountain building and of continent making, and on the whole was the most extensive and biologically notable event in geological history. In its effects on life, whether indirect or direct, it was of vastly greater significance than any period since, for contemporaneous with, and as a probable consequence of, this revolution was the incoming of the vertebrates with limbs and lungs, adapted to a terrestrial life. The Appalachians of the Paleozoic times were perhaps as high as the Sierra Nevada or Andean Cordillera of the present time. During this period the cryptogamous forests and their animal life may have been confined to the coastal plains and lowlands, while on the higher, cooler levels may have existed a different assemblage of life; and it is not beyond the reach of possibility that a scanty subalpine flora and fauna peopled the still cooler summits. But this process of mountain building and erosion was not confined to the end of the Paleozoic era. Since that period there have been along the Atlantic border of the growing and changing continent several successive cycles of denudation extending down to the present time. The great Appalachian plateau with its lofty mountain ranges and peaks rising from the shores of the Atlantic probably presented during the Mesozoic era different climatic zones, from tropical lowlands with their vast swamps, to temperate uplands, stretching perhaps up to Alpine summits. New Zealand at the present day has a subtropical belt of tree ferns, while the mountains bear glaciers on their summits. The Jurassic was a time of great denudation, when the high ranges of the Appalachian plateau were worn down, and the newly upheaved, tilted, and vaulted beds of the Trias were deeply eroded. During the Cretaceous period this region was a peneplain, the scenic features roughly recalling those of North Carolina and New England at the present day. Then there was a reëlevation, and in the Eocene Tertiary period the swelling and upheaval of the Appalachian dome began again.

We can in imagination see, as the result of these changes in a comparatively restricted portion of the earth's surface, resulting in the formation of separate basins or areas inclosed by mountain ranges, with different climates and zones on land, what a profound influence must have been exerted in the origination and also the extinction of species. In other parts of the world there were corresponding changes. The later revolutions, as those of Tertiary times, were perhaps less marked and extensive. Yet towards the close of this period the great mountain ranges of Asia and Europe, the Alps, Pyrenees, Caucasus, Himalayas, as well as the Atlas of North Africa and the Cordilleras of North and South America were upheaved. The western Alps rose to a height of 11,000 feet, and the Himalayas to a horizon 16,000 feet above the sea, while there were corresponding elevations in western North America and in the Rocky Mountain region.

The last great revolution, which, profound and widespread as it was in the Northern Hemisphere, did not apparently affect life and nature in the tropical zone, was the Glacial period. During this time there was, besides extensive migrations southward, and consequent modifications of species which could not resist the cold, a widespread extinction, not only of numberless individuals, but of floras and faunas, a few forms becoming adapted to a circumpolar climate.

Biological Extinction Due to Competition. During all these changes, as the result of the struggle for existence, the competition between the outgoing and the incoming types and floras and faunas, there resulted vast biological changes, i.e., extinctions and recreations.

In summing up the grand results of the Appalachian revolution and of the times immediately succeeding, Packard states that we should not lose sight of the fact that the changes in the earth's population were due to biological as well as geological and topographical factors. The process of extinction was favored and hastened by the incoming of more specialized forms, many of them being carnivorous and destructive. For example, nearly all fishes and reptiles live on other animals. The struggle for existence between those which became unadapted and useless in the new order of things went on more actively than at present. The process of extinction of the higher, more composite amphibians (the labyrinthodonts) was largely completed by the multitude of theromorphs and dinosaurs which overcame the colossal *Cheirotherium*, *Mastodonsaurus*, and their allies. Woodworth also states that "the exact cause of their decline is probably to be sought in the development of the more powerful reptiles." The demise of the ornithosaurs or pterodactyls was assisted, says Packard, in two ways: those with a feebler flight succumbed to the agile, tree-climbing dinosaurs; while the avian type, waxing stronger in numbers and powers of flight and exceeding in intelligence, exhausted the food supply of volant insects, and drove their clumsier reptilian cousins to the wall, fairly starving them out; just as at the present day the birds give the bats scarcely a *raison d'être*.

At the close of the Jura-Trias period there was a widespread extinction of the peculiar coniferous plants of the Mesozoic, and they were succeeded by forests of deciduous trees of modern types. Vast forests of deciduous trees, such as the oak, sassafras, poplar, willow, maple, elm, beech, chestnut, and many others, as well as of conifers and palms, clothed the uplands, while in the jungles, on the plains, and in the openings of the forests, gay flowers bloomed. The flora must even then have been, comparatively speaking, one of long existence, because highly differentiated composite plants, like the sunflower, occur in the Upper Cretaceous or Raritan clays of the New Jersey coast.

While the changes of level did not affect the abysses of the sea, the topography of the shallows and coast was materially modified, and to this was perhaps largely due the extinction of the ammonites and their allies.

In 1862 Wood more fully discussed this matter and mentioned the same cause as suggested by Packard. "This disappearance," says Wood, "of the Ammonitidæ, and preservation of the Nautilidæ, we may infer was due to the entire change which took place in the condition of the shores at the close of the Cretaceous period; and this change was so complete that such of the shore followers as were unable to adapt themselves to it succumbed, while the others that adapted themselves to the change altered their specific characters altogether. The Nautilidæ having come into existénce long prior to the introduction of the Ammonitidæ, and having also survived the destruction of the latter family, must have possessed in a remarkable degree a power of adapting themselves to altered conditions." On the other hand, the dibranchiate cephalopods (cuttles or squids), living in deeper water, being "ocean rangers," were quite independent of such geographical changes. Wood then goes on to say that the disappearance of the tetrabranchiate group affords a clew to that of the Mesozoic saurians, and also of cestraciont sharks, whose food probably consisted mainly of the tetrabranchiate cephalopods. "Now the disappearance of the Tetrabranchiata, of the cestracionts, and of the marine saurians, was contemporaneous; and we can hardly refuse to admit that such a triple destruction must have arisen either from some common cause or from these forms being successively dependent for existence upon each other."

Woodworth suggests that mammalian life in the Mesozoic age was unfavorably affected by the nature of the peneplain of the Atlantic coast and by reptilian life.

"The weak marsupials or low mammals, which first appear in this country with Dromatherium in the tolerably high relief of the Trias, were apparently driven to the uplands by the more puissant and numerous reptilia of the peneplain. Their development seems also to have been retarded." Again he says: "To sum up the faunal history of the Mesozoic alone, we have seen that *pari passu* with the creation of broad lowlands there was brought on to the stage a remarkable production of reptiles, a characteristic lowland life; and we note that the humble mammalia were excluded from the peneplain or held back in their development, so far as we know them by actual remains, during this condition of affairs until the very highest Cretaceous. At the close of the Mesozoic, the area of the peneplain was uplifted and there came into it the new life. Not only the changed geographic conditions, but the better fitted mammalia also were probably factors in terminating the life of the peneplains."

After the placental mammals once became established, as the result of favorable geographical conditions of migration, isolation, and secondarily of competition, the evolution as well as the elimination of forms, as is well known, went on most rapidly. Remains of over 2000 species of extinct mammals during Tertiary times which existed in America north of Mexico have been already described, where at present there are scarcely more than 300. This is an example of the amount of extinction which went on in a single class of animals. There must have been corresponding rates of extinction in the case of birds, fishes, and insects.

The rapid summary we have given of the successive changes and revolutions in the earth's history, and the fact that they are accompanied or followed by the process of the extinction of the unadapted, and their replacement by the more specialized and better adapted, show that there is between these two sets of phenomena a relation of cause and effect. The subject is further illustrated by the extinction of life in South America.

The Andean plateau during the Quaternary period was paroxysmally elevated into the air some 12,000 feet. Packard calls attention to the possible results of such an enormous upheaval on the plants and animals of this region. Before and at the time this movement began, when the land was 12,000 feet lower than now, the Atlantic trade winds, which now cross Brazil, impinge upon the Andes, and drop their moisture on the eastern slopes alone, favored as well the western slopes and Pacific coast. The tropical flora and fauna now confined to the neighborhood of Guayaquil on the coast of Peru then probably spread over Bolivia, Ecuador, Peru, and Chile to Patagonia. At Riobamba, altitude 9200 feet, the climate and vegetation are temperate; here occur bones of the mastodon, horse, deer, and llama—animals which may have lived in a temperate climate. But was not their extinction and that of the colossal sloths, armadillos, and other animals of the pampas, largely due to a change of climate resulting from the elevation of the Andean plateau? As the land gradually rose, the atmosphere would become more rarefied and insupportable to tropical life; the animals and plants would either seek lower levels or undergo extinction, or in certain cases become modified into species suited to a temperate climate. As the plateau rose still higher, the air would become too cold and rarefied for even the mastodon and horse. Gradually an alpine zone became established, and finally the higher peaks of the Andes, at an elevation of 15,000 feet, became mantled with perennial snow, and on Chimborazo glaciers established themselves. We thus see how, within Quaternary times, temperate and alpine zones became established over the vast Andean plateau, originally, perhaps at the end of the Pliocene, a plateau of the third order, clothed with vast forests like those of Brazil and Venezuela.

Another, but more local, cause of extinction is seen in Great Salt Lake, Utah. Formerly this was a vast fresh-water lake, abounding in fish, insects, mollusks, and plants. When it was by elevation of the lake basin transformed into a brine pool, all life was extinguished, except a shrimp, a single species of fly, and an alga. So with deserts; when they are formed, life is reduced to a relatively small proportion.

That there is a limit to the age of species as well as to individuals almost goes without saying. As there is in each individual a youth, manhood, and old age, so species and orders rise, culminate, and decline, and nations have risen, reached a maximum of development, and then decayed. The causes, however complex, are, in the case of plants and animals, apparently physical; they are general and pervasive in their effects, and have been in operation since life began; there have been critical periods in paleontological as well as geological history, and periods of rapid and widespread extinction as well as a continual, progressive dying-out of isolated species. Such extinction was, so to speak, a biological necessity, for otherwise there would have been no progress, no evolution of higher types.

Bibliography. Darwin, *Origin of Species* (6th ed., London, 1882); Searles V. Wood, "On the Form and Distribution of the Land Tracts during the Secondary and Tertiary Periods respectively, and on the Effects upon Animal Life which Great Changes in Geographical Configuration have probably Produced," in *Philosophical Magazine*, vol. xxiii, p. 161 (Edinburgh, 1862); A. S. Packard, "Geological Extinction and Some of its Apparent Causes," in *American Naturalist*, vol. xx, pp. 29–40 (Philadelphia, January, 1886); "A Half-Century of Evolution, with Special Reference to the Effects of Geological Changes on Animal Life," in *Proceedings of the American Association for the Advancement of Science* (Boston, 1898); J. B. Woodworth, "Base-Levelling and Organic Evolution," in *American Geologist*, vol. xiv (October, 1894). The best recent discussion of the subject, containing many additional titles of reference, is Osborn's *The Age of Mammals*, p. 615, title "Extinction," in index (New York, 1910).

EXTOR'TION (ML. *extortio*, Lat. *extorsio*, from *extorquere*, to extort, from *ex*, out + *torquere*, to twist). In its widest sense, any form of taking or obtaining anything from another by means of illegal compulsion or oppressive exaction. As a technical term of the common law, it has been judicially defined as the "crime committed by an officer of the law, who under color of his office unlawfully and corruptly takes any money or thing of value that is not due to him, or more than is due, or before it is due." It is by the common law a misdemeanor punishable by fine and imprisonment, and subjecting the offender to removal from office. In most of the United States the term has received statutory definition. For example, in New York it is defined as "the obtaining of property from another, with his consent, induced by a wrongful use of force or fear, or under cover of official right." (New York Penal Code, § 552.) Consult *Encyclopædia of Pleading and Practice*, vol. viii (23 vols., Northport, N. Y., 1894–1909).

EX'TRACT (ML. *extractus*, extract, from Lat. *extractus*, p.p. of *extrahere*, to draw out, from *ex*, out + *trahere*, to draw). In a medical or pharmaceutical sense, any vegetable preparation obtained by treating a plant with a solvent and evaporating the solution to about the consistency of honey; or by expressing the juice of the plant and evaporating—forming respectively liquid and solid extracts. Extracts contain only those vegetable principles that are either held in solution in the juices of the plants themselves, or are soluble in the liquid employed in extracting them, and at the same time are not so volatile as to be lost during evaporation. Since many extractive matters are more or less volatile, it makes a great difference whether the operation is conducted at a low or at a high temperature. Extracts are called watery or aqueous, alcoholic, or ethereal, according to the menstruum employed. Extracts are liable to great uncertainty in point of strength and composition, and require to be prepared with great care. Evaporation *in vacuo* is found to be a great improvement, as it may be effected at relatively low temperatures.

EXTRACT OF MEAT. An extract obtained by treating chopped meat (beef) with cold water, then very gradually raising the temperature, when about one-eighth of the weight of the meat is dissolved, leaving an almost tasteless insoluble fibrine. (See Beef Tea; Broth.) Heating coagulates the nutritious albumen, which forms a scum and is removed along with any fat. The liquid may be concentrated into small bulk, either in an open pan or in partial vacuum, yielding a more or less thick paste or thick liquid which consists of the so-called meat extractives, including substances which give flavor to meat. *Bouillon Cubes, Soup Tablets*, etc., are made from meat extract concentrated until very thick and sometimes specially flavored. Extract of beef is used to make beef tea, bouillon soups, to flavor gravies, and in many similar ways in cookery. It has almost no nutritive value, although it stimulates a normal flow of gastric juice and so may aid the digestion of other foods. It is for such stimulating properties that it is used in the sick room. Consult *United States Department of Agriculture, Bureau of Chemistry, Bulletin 114*, "Meat Extract and Similar Preparations." See Meat Extract; Food, Preservation of.

EXTRA CURRENT. See Electricity.

EX'TRADI'TION (from Lat. *ex*, out + *traditio*, delivery, from *tradere*, to give over). The surrender by one state or nation to another of a fugitive from justice. Strictly speaking, extradition is a modern practice, although Hannibal's delivery was stipulated for in a Roman treaty, and more than once Roman citizens were surrendered to a foreign power. These acts, like many others in ancient, mediæval, and early modern times, were confined to those who were considered enemies of the state. The right to deny the privilege of asylum was a prerogative of the sovereign, and sovereigns frequently used it so as best to secure their personal interests. Thus, extradition was confined to what we should now call political offenses.

It is mainly within the last 100 years that a deeper international comity has developed. Increased intercourse and modern means of transportation have greatly facilitated flights from justice, while a sense of common interest has done much to diminish international jealousy and distrust. Each decade it has become more evident that the failure of civil justice in one country is likely to result unfavorably to its neighbor. No country has ever willingly received the convicts of another, and it was not possible that nations with liberal ideas should long fail to perceive that there was no great difference between encouraging crime and furnishing an asylum for fugitives from justice. If, then, there was a common national interest in the punishment of criminals, and if offenders against foreign laws were undesirable immigrants, extradition was both an advantage and a duty.

The great writers on international law have not been in harmony on the question as to whether extradition is, in the absence of agreement, a matter of international obligation. Some of the ablest have argued in the affirmative, but the modern writers, like Bluntschli, Fiore, Phillimore, Westlake, Hall, and Moore, who have so successfully labored to place the law of nations on a sound legal basis, are agreed that the obligation is a purely moral one. But the wisdom of the practice is generally recognized, as is the principle that, owing to the great difference between the political systems and penal codes of different nations, it was better for them to give their mutual obligations in this respect definite expression in treaties. The real history of extradition in England begins with the Ashburton Treaty of 1842 with the United States. Excepting the Jay Treaty of 1794, which contained provisions for extradition limited to 12 years, all the other treaties covering this subject made by the United States are of a subsequent date. The conventions between the United States and Great Britain, in 1842, 1889, and 1900, show what offenses two leading nations of to-day consider extraditable. The first covered the crimes of murder, assault with intent to commit murder, piracy, arson, robbery, forgery, and the utterance of forged papers; that of 1889 added voluntary manslaughter, counterfeiting, or altering money, embezzlement, larceny, fraud by a bailee, banker, etc., perjury or subornation of perjury, rape, abduction, child stealing, kidnapping, burglary, etc., piracy by the law of nations, revolt or conspiracy to revolt by two or more persons on board a ship on the high seas, crimes and offenses against the laws of both countries for the suppression of slavery and slave trading; and the supplementary Treaty of 1900 added the crimes of obtaining money, valuable securities, or other property by false pretenses, willful and unlawful destruction or obstruction of railroads endangering human life, and procuring abortion.

The tendency is to enlarge the list of extraditable crimes; but there are many offenses which, for obvious reasons, cannot properly be included. Such are political crimes and offenses against religion and marriage laws. The general rule is that an extraditable crime must be one commonly recognized by civilized nations as *malum in se*, and not merely *malum prohibitum*.

The method and prerequisites of extradition may, perhaps, best be shown by a quotation from the Ashburton Treaty. It provides that the two powers shall, upon mutual requisitions, deliver up to justice all persons charged with the commission of certain crimes, "provided that this shall only be done upon such evidence of criminality as, according to the laws of the place where the fugitive or person so charged shall be found, would justify his apprehension and commitment for trial if the crime or offense had there been committed; and the respective judges and other magistrates of the two governments shall have power, jurisdiction, and authority, upon complaint made under oath, to issue a warrant for the apprehension of the fugitive or person so charged, that he may be brought before such judges or other magistrates respectively, to the end that the evidence of such criminality shall be heard and considered; and if, on such hearing, the evidence be deemed sufficient to sustain the charge, it shall be the duty of the examining judge or magistrate to certify the same to the proper executive authority, that a warrant may issue for the surrender of such fugitive." The complaint under oath is commonly made by a consular officer of the state asking for extradition. If all the proceedings are satisfactory, the President of the United States (in our practice) causes the surrender to be made to the agent of the demanding power. The expenses are borne by the party making the requisition.

There are two limitations on the practice of extradition which are worthy of notice: 1. It is an almost universal rule that a state will not surrender its own citizens to a foreign power. This is due to the national sentiment that leads each nation to regard its own laws and administration of justice as superior to those of foreign powers, and to the equally natural desire to give its own citizens the benefit of those laws. 2. It is generally regarded as an abuse of the principle of extradition for a state to secure the rendition of a criminal for an extraditable offense and then to try and punish him for an offense not included in the treaty.

From the fact that difficulties in regard to extradition are most satisfactorily anticipated by treaties, it should not be inferred that extradition has not taken place without them. Spain and other countries having no treaty of extradition with Great Britain have surrendered criminals upon her requisition. The rule in the United States is neither to ask nor to grant extradition in the absence of a treaty, but this country has not disdained to accept this evidence of international comity from other states—as when Spain of her own volition surrendered the notorious William M. Tweed to the New York authorities in 1876—and has acted on the principle herself in the surrender of Arguelles to Spain in 1863.

The law of extradition between the different States of the United States is laid down in Art. IV, sec. 2, of the Constitution, and in a law of Congress of Feb. 12, 1793. The former reads: "A person charged in any State with treason, felony, or other crime, who shall flee from justice and be found in another State, shall, on demand of the executive authority of the State from which he fled, be delivered up, to be removed to the State having jurisdiction of the crime." The latter provides for the form in which the demand shall be made, whereupon it shall be the duty of the Governor to whom it is addressed to cause the fugitive to be arrested and delivered over to the agent of the other State. The prerequisites of a valid demand are a formal charge that a crime has been committed against the laws of the demanding State, and that the person charged has fled to the State on whose executive the demand is made. It is the duty of the Governor on whom the demand is made, although the alleged offense may not be a crime in the State where the fugitive has sought an asylum, to deliver the fugitive, but its performance which is sometimes refused cannot be compelled.

Consult: Moore, *Treatise on Extradition and Interstate Rendition* (Boston, 1891); Hawley, *Interstate Extraditions* (Detroit, 1890); Spear, *Law of Extraditions, International and Interstate* (2d ed., Albany, 1884); Rorer, *American Interstate Law* (2d ed., Chicago, 1893); Biron and Chalmers, *The Law and Practice of Extradition* (London, 1903); Clarke, *The Law of Extradition* (ib., 1903); Bailey, *Treatise on the Law of Habeas Corpus* (2 vols., Chicago, 1913);

and the authorities referred to under International Law.

EX'TRALITE. See Explosives.

EXTRAORDINARY RAY. See Light.

EXTRATERRITORIALITY. See Exterritoriality.

EXTRAV'AGAN'TES CON'STITU'TIO'NES (Lat. *extra*, outside + *vagari*, wander). Papal constitutions of John XXII and some of his successors, supplemental to the "Corpus Juris Canonici." They got their name from the fact that they were not arranged in order with the other constitutions, but were "outside wanderers" from the general code.

EXTRAVAGAN'ZA (It., extravagance). A musical or dramatic piece of great wildness or absurdity, characterized by extravagant and fantastic qualities. The term is often applied to various other kinds of writing marked by unbridled or eccentric fantasy.

EXTRAVASA'TION (from ML. *extravasatus*, extravasated, from Lat. *extra*, beyond + *vas*, vessel). The escape of any of the fluids of the living body from their proper vessels through a rupture or injury in their walls. Excrementitious matter thus sometimes escapes into the abdomen through a wound or ulceration of the bowels. But the term is oftenest used in speaking of the escape of blood from injured blood vessels. Extravasation is distinguished from exudation by this, that in the last the vessels remain entire, and the effusion takes place by filtration through their walls; nor does more than a part of the blood so escape, the blood globules being retained, while in extravasation entire blood is effused. Many kinds of extravasation are rapidly fatal, such as that of urine or of bile into the abdomen, or of blood from the vessels of the brain in many cases of apoplexy. The dark color resulting from a bruise is due to extravasated blood from lacerated capillaries.

EXTREME UNCTION (Lat. *extrema unctio*). A sacrament of the Roman Catholic church, which, as the other sacraments supply spiritual aid in the various circumstances of life, is believed to impart to the Christian grace and strength to encounter the struggle, as well spiritual as bodily, of the dying hour. The rite of unction or anointing in different forms is common to four of the sacraments; the name "extreme" is given to that of the present sacrament because it is reserved for the last act of the Christian career. The Council of Trent declares this sacrament, although "promulgated" in the well-known passage of St. James v. 14, 15, to have been "instituted" by Christ. The fathers frequently allude to the rite of unction, and although many of these allusions certainly refer to the unctions of baptism and confirmation, yet several passages in Origen, Chrysostom, Cæsarius of Arles, and Pope Innocent I, are interpreted as referring to the unction of the dying. In the various separated churches of Oriental Christians—Greek, Coptic, Armenian, and Nestorian—the rite is found, although with many ceremonial variations. In the Roman Catholic church the sacrament is administered by the priest, who, "dipping his thumb in the holy oil, anoints the sick person, in the form of the cross, upon the eyes, ears, nose, mouth, hands, and feet, at each anointing making use of this form of prayer: 'Through this holy unction, and His most tender mercy, may the Lord pardon thee whatever sins thou hast committed by thy sight. Amen.'" And so of the hearing and the rest, adapting the form to the several senses. Extreme unction is reputed by Catholics one of the sacraments "of the living"; i.e., it ordinarily requires that the recipient should be in a state of grace, or, in other words, should have received the remission of his sins by absolution or by perfect contrition; but it is held to remit, *indirectly*, actual sins not previously remitted, and also (although not infallibly, but according to the merciful designs of Providence) to alleviate, and even to dispel, the pains of bodily disease. The holy oil which forms the "matter" of this sacrament must be blessed by the bishop—a ceremony which is performed with great solemnity once each year by the bishop, attended by a number of priests, on Maundy Thursday. The oil so blessed is reserved for use during the year. Formerly several priests united in the administration of the sacrament, and the custom is still maintained in the Greek church; among Roman Catholics one priest now administers it. The Greek form of words also differs, although not substantially, from that of the Latin church. The Greeks call this sacrament "the holy oil" and sometimes "the oil of prayer." Consult: Schanz, *Die Lehre von den heiligen Sacramenten* (Freiburg, 1893); Schmitz, *De Effectibus Sacramenti Extremæ Unctionis* (ib., 1893); Kern, *De Sacramenti Extremæ Unctionis* (Ratisbon, 1907); Puller, *The Anointing of the Sick in Scripture and Tradition* (London, 1904). See Unction.

EXUMAS, ĕks-ōō'mȧz. An archipelago in the British West Indies, part of the Bahamas (q.v.), between Andros and Long Island (Map: West Indies, C 1). It comprises the islands of Great Exuma, Little Exuma, and the Exuma Keys, occupying a total area of about 150 square miles. Little Exuma has one of the best harbors in the Bahama group. The inhabitants are employed partly in agriculture, but chiefly in salt making. Pop. (of group), 1901, 3086; 1911, 3465.

EX UN'GUE LEONEM. See Ex Pede Herculem.

EYAS, ī'*a*s. See Falconry.

EYB, īb, Albrecht von (1420–75). A German writer and humanist, born in Franconia. He studied at Pavia, became Archdeacon of Würzburg in 1449, and later entered the service of Pope Pius II. His work on marriage, entitled *Ehestandsbuch* (1472), has frequently been reprinted. The most recent editions are those of K. Müller (in modern German) (Sondershausen, 1879) and Herrmann (Berlin, 1890). Consult Herrmann, *Albrecht von Eyb und die Frühzeit des deutschen Humanismus* (1893).

EYCK, īk, Huybrecht (Hubert) (c.1365–1426), and Jan (John) (c.1385–1441) van. Brothers, Flemish painters, founders of the school of painting of the Netherlands. Their fame rests upon some of the greatest services to modern art that it is possible to conceive. They were the first to perfect and successfully use oil as a medium for mixing colors, which revolutionized the painting of Europe; to use the landscape as an accessory, which contributed to the harmony of the painting; and to discover aërial perspective, learned by the Italians 50 years later. The figures of their panels were thoroughly naturalistic—real Flemish men and women. As there are practically no survivals of Flemish painting preceding theirs, it is difficult to ascertain the evolution of their art: but from a study of the illuminated manuscripts and tapestries of the late fifteenth and early sixteenth centuries it is evident that Hubert's art represents the culmination of mediæval painting in northern Europe; while Jan, like Leonardo in Italy, incorporated in his art the naturalistic and technical elements of all that preceded in northern France and the Netherlands. The perfection of the oil technique was probably due to Hubert, who was much the elder; but the other innovations were due to Jan.

The brothers Van Eyck take their name from a little town on the Maas, near Maastricht, called Maaseyck, where they were born. The dates of their birth are variously assigned. There is no proof for the assumption that Hubert traveled widely in Europe. From reliable documentary evidence we know only that in 1425 he was paid for two sketches of a painting ordered by the city council of Ghent, and that in the same year he was employed on a large altarpiece for Robert Poortier and his wife in St. Savior's, Ghent. Before this time he had begun the great altarpiece of Ghent upon which his fame chiefly rests. Between Aug. 1, 1425, and the same date, 1426, the magistrates of Ghent visited his workshop, probably to inspect the altarpiece. He did not live to finish this work, but died on Sept. 18, 1426, and was buried in the crypt directly under the chapel, which was afterward adorned with his masterpiece. As regards the life of Jan, we are better informed. He was probably the pupil of his brother, who much exceeded him in years. From c.1422 till 1424 he was in the service of John of Bavaria, then living as Count of Holland at The Hague, employed in decorating his palace. After this patron's death, in 1425, he was appointed court painter and valet de chambre (a sort of chamberlain), with a salary of 100 livres a year, to Philip the Good, Duke of Burgundy. He lived at Lille with the Duke, who employed him upon various diplomatic missions—in 1426–27, e.g., on two secret missions of importance, for which he was liberally rewarded. In 1428–29 he was one of the embassy sent to Lisbon to negotiate the marriage of the Princess Isabella of Portugal to his master, and painted a portrait of the princess, which confirmed the Duke's choice. During his stay in Portugal he became acquainted with the southern landscape and vegetation which henceforth appear in his pictures. He made a pilgrimage to Santiago di Compostella and visited the Alhambra. After his return to Flanders, Christmas Day, 1429, he settled at Bruges, and there he finished the altarpiece which his brother had left incomplete, on May 6, 1432. From 1430 till his death was the period of his ripest and best work. He was visited and honored, not only by the magistrates of Bruges, but by Duke Philip, who stood sponsor to his son in baptism and finally increased his yearly pension to 4320 livres (Parisian). In 1436 he was sent upon another distant diplomatic mission. He died at Bruges on July 9, 1441, and lies buried in the church of St. Donatus.

The great polyptych in the church of St. Bavon, now the cathedral of Ghent, is the masterpiece of the brothers Van Eyck. It is not known who gave the original commission; but it was certainly completed at the expense of Jodoc Vydt, Lord of Pamele, etc., a prominent burgher of Ghent. It contains more than 20 panels portraying the central dogma of the Christian religion, the "Redemption from Sin through the Sacrifice of the Lamb." Both exterior and interior of the altar are painted. The predella, now lost, represented "Purgatory"; the central part of the exterior is the "Annunciation," of wondrous charm, and above it the prophets "Micah" and "Zachariah" and the "Two Sibyls," who foretold Christ's birth and sacrifice. In the centre, below the "Annunciation," are "John the Baptist" and "John the Evangelist," the patrons of the church, painted like contemporary stone statues, and on either side of them kneeling figures of the donors, Jodoc Vydt and Isabella Burluut, his wife—portraits of admirable realism. The interior of the altar, opened only on great occasions, reveals the central truth of the Christian faith, for which the exterior prepares us. It is painted in two tiers, the upper representing heaven. The central panel is the majestic figure of "The Almighty Enthroned"; on the left is the "Virgin," wearing a precious diadem, on the right the austere figure of "St. John Baptist"—all more than life size. There follow the "Angel Musicians" and the "Angel Singers"—delightful Flemish maidens—and at the extreme ends are the panels of Adam and Eve—the first important nudes in northern painting. The central and principal panel of the lower tier is the "Mystic Sacrifice of the Lamb," in a marvelous southern landscape, and with a multitude of Apostles, saints, prophets, and heathen seers who foretold the sacrifice. The two panels on the left typify the laity—the "Knights of Christ," riding majestically forward, and the "Just Judges," with supposed portraits of the brothers Van Eyck. On the right the clergy—the "Holy Hermits" and the "Holy Pilgrims"—march sturdily forward.

The part taken by the two brothers in this great work is a subject of much controversy. The general plan is due to Hubert, but most of the execution to Jan. From Jan's other works we know that his art was very minute and realistic, and it is reasonable to suppose that Hubert, who was much older, approximated more closely to the mediæval manner, which was more monumental. Applying this criterion to the Ghent altar, the central figures of the "Almighty," the "Virgin," and "John the Baptist" must be assigned to Hubert, and part at least of the "Adoration of the Lamb." The attribution of other works to Hubert is very doubtful—such as certain miniatures in the celebrated *Book of Hours* of Duc Jean du Berry, photographed before they were destroyed by fire at Turin in 1904; and numerous recent attributions of paintings, more probably to be ascribed to Jan.

The Ghent altar is the most impressive religious monument of northern painting and ranks in importance with the Brancacci Chapel in Florence. It was held in the highest repute, both when it was executed and in the centuries following. It survived the Burgundian wars and the iconoclastic riots of the Reformation. Philip II in vain attempted to acquire it for Spain, but had to content himself with a copy finished by Michiel Coxcie (q.v.) in 1559. The original was taken, in part, to Paris during the French Revolution, but was returned to Ghent. After its return the wings were sold, and are in the Museum of Berlin, except "Adam" and "Eve," which are now at Brussels. The central panels are still in Ghent Cathedral, the wings being supplied by Coxcie's copies.

A far larger number of paintings may be

safely ascribed to Jan. A charming little Madonna (1432), characteristic of his early work, is at Ince Hall, near Liverpool. The National Gallery (London) has three good portraits—an unknown man (1432), called the "Scholar"; the "Man with a Turban" (1433), supposed to be Jan van Eyck himself; and the newly married "Giovanni Arnolfini and his Wife," a wonderful piece of realism. At Paris there are "Madonna with the Child," in the Rothschild collection, and the "Madonna of the Chancellor Rollin," in the Louvre. The Antwerp Museum possesses "St. Barbara" (1439), while Bruges has the powerful "Madonna of Canon George van der Pael" (1436) and the portrait of "The Artist's Wife" (1439). In Vienna are the portraits of Nicolas Albergati, Cardinal of Santa Croce (1432), and Jan de Leeuw (1436), and at Frankfort is a delightful "Madonna Suckling the Child" of the early period. At Dresden there is a small triptych, which, according to the legend, was used by Charles V on his travels. The central panel shows the Madonna in a beautiful Gothic chapel; on one wing are "St. Michael and the Donor," on the other "St. Catharine." St. Petersburg possesses an "Annunciation," a "Crucifixion," and a "Last Judgment." The Berlin Museum is richest of all in works of Jan van Eyck. Besides the parts of the Ghent altar, and other works of more doubtful authenticity, it possesses the portraits of an "Esquire of the Order of St. Anthony," "Giovanni Arnolfini," and a "Knight of the Golden Fleece." In the Metropolitan Museum, New York, is a head of Thomas à Becket (Morgan collection), besides a school piece (the "Virgin and Child"), while the Johnson collection, Philadelphia, possesses "St. Francis Receiving the Stigmata"—one of the artist's finest portraits.

A prominent characteristic of Jan van Eyck's panels is their detailed finish, almost like the miniatures of a manuscript. They are like exquisitely wrought jewels. Such detail, of course, precludes emphasis, which is only in part atoned for by beauty and delicacy. His realism, as evinced in such figures as "Adam" and "Eve," must have been a revelation to contemporaries. His landscapes are well selected and, like his interiors, form admirable backgrounds for his pictures, giving unity to the composition. He did not understand linear perspective, but rendered atmospheric gradations with great skill and understood to a remarkable degree the handling of light and shade. Most charming of all is his color—bright, but in a low key, and pervaded by reddish-brown tone, full of light. He was, moreover, an excellent draftsman. Although the influence of his art was unbounded—extending through Germany, France, Spain, and southern Italy—Jan van Eyck never founded a school in the strict sense of the term.

Bibliography. The documentary evidence on the life of the Van Eyck brothers has been collected from the archives of Ghent and Bruges, published by Weale, and utilized in his *John and Hubert van Eyck* (London, 1908; 1912). The best critical discussion of their art is the lengthy account by Professor Dvořák, "Das Rätzel der Kunst der Brüder van Eyck," in *Jahrbuch kunsthistorischen Sammlungen* (Vienna, 1903). Other good monographs are by Kämmerer, in Knackfuss, *Künstler Monographien* (Bielefeld, 1898); Hyman (Paris, 1908); Durand-Gréville (Brussels, 1910). Consult also Lalaing, *Jean van Eyck* (Lille, 1887), and Voll, *Die altniederländische Malerei von van Eyck bis Memling* (Leipzig, 1906).

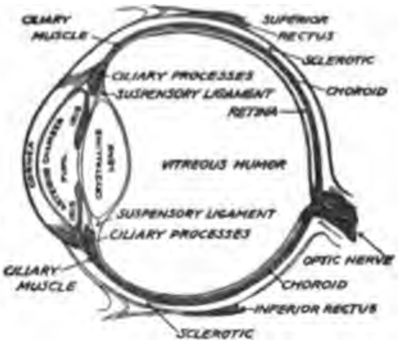
EYDE, Samuel (1866–). A Norwegian electrochemist, engineer, inventor, and manufacturer, born at Arendal. He studied for his profession in Norway and Berlin, where he obtained his doctor's degree, and practiced engineering in Germany, Sweden, and Norway. Realizing that the soils of nations greatly needed fertilization, he and Prof. Kristian Birkeland of the University of Christiania conceived the idea of producing fertilizers from the air (azote or nitrogen) and limestone by electricity. After much labor they succeeded in the invention and (1903) began manufacturing with a 5 horse-power motor and three men. Nine years later (1912), Dr. Eyde owned three waterfalls, producing a total of 200,000 horse power, a factory employing 400 chemists, engineers, etc., and 1340 laborers, producing 2000 barrels of Norway saltpetre a day. In 1914 Dr. Eyde had secured another waterfall and built another factory using 200,000 horse power, giving his plants a capacity of 400,000 horse power. Still another 150,000 horse power he reserved. The plants represented a capital of 100,000,000 crowns, and around them the three towns—Notodden, Saaheim, and Eydehavn, where high explosives are also manufactured—had sprung up as results of the industry.

EYE (AS. *ēage*, Goth. *augō*, OHG. *ouga*, Ger. *Auge*, Icel. *auga*, OSw. *ouga*, Sw. *öga*, Dan. Nor. *öie*, Lat. *oculus*, eye, Gk. *ὄσσε*, *osse*, the two eyes, OChurch Slav. *oko*, Skt. *akṣan*, eye). The organ of sight. In this article we shall consider the structure of the human eyeball, and of certain accessory parts or appendages which serve to protect that organ and are essential to the due performance of its functions.

The *globe of the eye* is placed in the anterior part of the cavity of the orbit, in which it is held in position by its connection with the optic nerve posteriorly, and with the muscles which surround it, and by the eyelids in front. It is further supported behind and on the sides by a quantity of loose fat, which fills up all the interstices of the orbit and facilitates the various movements of which the eye is capable. The form of the eyeball is nearly spherical; but on viewing the organ in profile we see that it is composed of segments of two spheres of different diameters. Of these the anterior, formed by the transparent cornea, has the smaller diameter and is therefore more prominent, and hence the anteroposterior slightly exceeds (by about a line) the transverse diameter. The radius of the posterior or sclerotic segment is about $\frac{18}{40}$, and that of the anterior segment about $\frac{13}{40}$, of an inch. When the eyes are in a state of repose, their anteroposterior axes are parallel; the optic nerves, on the other hand, diverge considerably from their commissure within the cavity of the skull to the point where they enter the globe; consequently their direction does not coincide with that of the eye. Each nerve enters the back of the globe at a distance of about ⅛ of an inch on the inner side of the anteroposterior axis of the eye.

The eyeball is composed of several investing membranes and of certain transparent structures which are inclosed within them, and which, together with the cornea, act as refractive media of various densities upon the rays of light which enter the eye.

The outermost coat of the eye is the *sclerotic* (from Gk. σκληρός, *sklēros*, hard). It is a strong, dense, white, fibrous structure, covering about four-fifths of the eyeball, and leaving a circular deficiency anteriorly, which is occupied by the cornea. Posteriorly it is perforated by the optic nerve, and it is there continuous with the sheath which that nerve derives from the dura mater, the fibrous investment of the brain and spinal cord. Near the entrance of the nerve its thickness is about $\frac{1}{25}$ of an inch; from this it diminishes to about $\frac{1}{50}$; but in front it again becomes thicker, from the tendinous insertions of the straight muscles which blend with it. This coat, by its great strength and comparatively unyielding structure, maintains the inclosed parts in their proper form and serves to protect them from external injuries.



SECTION OF EYEBALL.

The *cornea* (so called from its horny appearance) is a transparent structure, filling up the aperture left in the anterior part of the sclerotic. Its circumference is overlain by the free edge of the sclerotic, which in some parts presents a groove, so as to retain it more firmly; and the connection by continuity of texture between the two structures is so close that they cannot be separated in the dead body without considerable maceration. The cornea, in consequence of its greater convexity, projects beyond the line of the sclerotic: the degree of convexity, however, varies in different persons and at different periods of life. It is thicker than any part of the sclerotic, and so strong as to be able to resist a force capable of rupturing that tunic. Although perfectly transparent and apparently homogeneous, it is in reality composed of five layers, clearly distinguishable from one another—viz. (proceeding from the front backward): 1. The conjunctival layer of epithelium. It is in this epithelium that particles of iron, stone, etc., forcibly driven against the eye usually lodge, and it is a highly sensitive membrane. 2. The anterior elastic lamina forming the anterior boundary of the cornea proper; it is not more than $\frac{1}{1000}$ of an inch in thickness, and its function seems to be that of maintaining the exact curvature of the front of the cornea. 3. The cornea proper, on which the thickness and strength of the cornea mainly depend. 4. The posterior elastic lamina, which is an extremely thin membrane, in which no structure can be detected. It probably contributes, like the anterior lamina, to the exact maintenance of the curvature of the cornea, so necessary for correct vision. 5. The posterior endothelium of the aqueous humor, which is probably concerned in the secretion of that fluid.

The *choroid coat* is a dark-colored vascular membrane, which is brought into view on the removal of the sclerotic. Its outer surface, which is nearly black, is loosely connected with the sclerotic by connective tissue, in which are contained certain nerves and vessels (termed the ciliary nerves and vessels) which go to the iris. Its inner surface is soft, villous, and dark-colored. In front it is attached to the membrane of the vitreous humor by means of the ciliary processes, which consist of about 60 or 70 radiating folds. These are alternately long and short, each of them being terminated by a small, free, interior extremity, and they are lodged in corresponding folds in the membrane of the vitreous humor. In other parts it is loosely connected with the retina. The choroid is composed of minute ramifications of vessels (especially of veins which, from their whorl-like arrangement, are termed *vasa vorticosa*), of connective tissue, and of pigment cells, which usually approximate to the hexagonal form and are about $\frac{1}{1000}$ of an inch in diameter. In albinos this pigment is absent, and hence their eyes have a pink appearance, which is due to the unconcealed blood in the capillaries of the choroid and iris. See ALBINO.

The *iris* may be regarded as a process of the choroid, with which it is continuous, although there are differences of structure in the two membranes. It is a thin, flat, membranous curtain, hanging vertically in the aqueous humor in front of the lens and perforated by the pupil for the transmission of light. It divides the space between the cornea and the lens into an anterior (the larger) and a posterior (the smaller) chamber, these two chambers freely communicating through the pupil. The outer and larger border is attached all round to the line of junction of the sclerotic and the cornea, while the inner edge forms the boundary of the pupil, which is nearly circular, and varies in size according to the action of the muscular fibres of the iris, so as to admit more or less light into the interior of the eyeball, its diameter varying, under these circumstances, from about $\frac{1}{4}$ to $\frac{1}{10}$ of an inch. It is muscular in its structure, one set of fibres being arranged circularly round the pupil and, when necessary, effecting its contraction; while another set lies in a radiating direction from within outward and by its action dilates the pupil. These fibres are of the unstriped and involuntary variety. The nerves which are concerned in these movements will be presently noticed.

The *ciliary muscle* is a thin band or ring of nonstriated muscular fibres which lies between the iris and the choroid. Its posterior attachment is to the anterior margin of the choroid, while anteriorly it is attached by an annular ligament to the outer margin of the iris and to the adjacent portions of the cornea and sclera. By the contraction of this muscle the choroid is drawn forward, the suspensory ligament of the *lens* is relaxed, and *accommodation* of the eye is effected. The varieties of color in the eyes of different individuals, and of different kinds of animals, depend mainly upon the color of the pigment which is deposited in cells in the substance of the iris.

Within the choroid is the *retina*, which, although continuous with the optic nerve—of which it is usually regarded as a cuplike expansion—differs very materially from it in structure. Before noticing the elaborate microscopical structure of this part of the eye, we shall briefly mention those points regarding it which can be established by ordinary examination. It is a delicate semitransparent sheet of nervous matter, lying immediately behind the vitreous humor, and extending from the optic nerve nearly as far as the lens. On examining the concave inner surface of the retina at the back of the eye, we observe, directly in a line with the axis of the globe, a circular yellow spot called "macula lutea," and known, after its discoverer, as "the yellow spot of Sömmering," of about $\frac{1}{20}$ of an inch in diameter. The only mammals in which it exists are man and the monkey. It is the area of most distinct vision—a circumstance which may partly be accounted for by the fact that it is singularly free from blood vessels, which curve round it and apparently avoid it. The structure of the retina, as revealed by the microscope, is remarkable. Although its greatest thickness (at the entrance of the optic nerve) is only about $\frac{1}{80}$ of an inch, and as it extends anteriorly it soon diminishes to $\frac{1}{200}$ of an inch, the following layers from without inward may be distinguished in all parts of it: (1) the layer of rods and cones, termed, from its discoverer, the *membrane of Jacob;* (2) the external limiting membrane; (3) the outer nuclear layer; (4) the outer molecular layer; (5) the inner nuclear layer; (6) the inner molecular layer; (7) the layer of ganglion cells; (8) the layer of nerve fibres; (9) the internal limiting membrane.

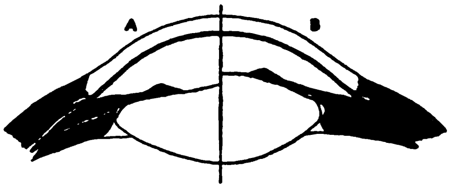


DIAGRAM ILLUSTRATING THE MECHANISM OF ACCOMMODATION OF THE EYE.

In *B* the lens is accommodated for near objects; in *A* it is accommodated for objects at a distance.

It now remains to describe the *transparent media* which occupy the interior of the globe, and through which the rays of light must pass before they can reach the retina and form on it the images of external objects.

Immediately behind the transparent cornea is the *aqueous humor*, which fills up the anterior and posterior chambers which lie between the cornea and the lens. As its name implies, it is very nearly pure water, with a mere trace of albumen and chloride of sodium. As no epithelium exists in front of the iris, or on the anterior surface of the lens, it is most probably secreted by the cells on the posterior surface of the cornea.

The *crystalline lens* lies opposite to and behind the pupil, almost in contact with the iris, and its posterior surface is received into a corresponding depression in the vitreous humor. In form, it is a double-convex lens, with surfaces of unequal curvature, the posterior being the most convex. It is inclosed in a transparent capsule, of which the part covering the anterior surface is nearly four times thicker than that at the posterior aspect, in consequence, doubtless, of greater strength being required in front, where there is no support, than behind, where the lens is adherent to the vitreous membrane. The microscopic examination of the substance or body of the lens shows it to be composed of extremely minute, elongated, ribbon-like structures, commonly called the *fibres of the lens*, which are developed from cells. These fibres are arranged side by side in lamellæ, of which many hundred exist in every lens, and which are so placed as to give to the anterior and posterior surfaces the appearance of a central star, with meridian lines. The lens gradually increases in density, and at the same time in refracting power, towards the centre; by this means the convergence of the central rays is increased, and they are brought to the same focus as the rays passing through the more circumferential portions of the lens. (According to Brewster, the refracting power at the surface is 1.3767, and at the centre 1.3990.) The lens contains 58 per cent of water, 36 of albumen, with minute quantities of salts. In consequence of its proteid constituent, it becomes hard and opaque on boiling, as we familiarly see in the case of the eyes of boiled fish. In the adult its long diameter ranges from ⅓ to ⅜, and its antero-posterior diameter from ⅓ to ⅙ of an inch, and it weighs three or four grains.

The *vitreous humor* lies in the concavity of the retina and occupies about four-fifths of the eye posteriorly. It is inclosed in the hyaloid membrane, which sends numerous processes inward, so as to divide the cavity into a series of compartments, and thus to equalize the pressure exerted by the inclosed soft, gelatinous mass. Between the anterior border of the retina and the border of the lens we have a series of radiating folds, or plaitings, termed the *ciliary processes of the vitreous body*, into which the *ciliary processes of the choroid* dovetail. The vitreous humor contains 98.4 per cent of water, with a trace of albumen and salts, and hence, as might be expected, its refractive index is almost identical with that of water.

The appendages of the eye may now be described. The most important of these are the *muscles within the orbit*, the *eyelids*, the *lachrymal apparatus*, and the *conjunctiva*, to which (although less important) we may add the *eyebrows*.

The *muscles* by which the eye is moved are four straight (or *recti*) muscles, and two oblique (the superior and inferior). The former rise from the margin of the optic foramen at the apex of the orbit and are inserted into the sclerotic near the cornea, above, below, and on either side. The superior oblique arises with the straight muscles, but, after running to the upper edge of the orbit, has its direction changed by a pulley and proceeds backward, outward, and downward. The inferior oblique arises from the lower part of the orbit and passes backward, outward, and upward. The action of the straight muscles is sufficiently obvious from their direction—when acting collectively they fix and retract the eye, and when acting singly they turn it towards their respective sides. The oblique muscles antagonize the recti and draw the eye forward; the superior, acting above, directs the front of the eye downward and outward, and the inferior upward and inward. By the duly associated action of these muscles, the eye is enabled to move (within definite limits) in every direction.

The *eyelids* are two thin, movable folds placed in front of the eye to shield it from too strong light and to protect its anterior surface. They are composed (1) of skin; (2) of a thin plate of fibrocartilage, termed the tarsal cartilage, the inner surface of which is grooved by 30 or 40 parallel vertical lines, in which the Meibomian glands are embedded; and (3) of a layer of mucous membrane, continuous, as we shall presently see, with that which lines the nostrils and which joins the skin at the margin of the lids, in which the eyelashes (*cilia*) are arranged in two or more rows. The upper lid is much the larger, and to the posterior border of its cartilage a special muscle is attached, termed the *levator palpebræ superioris*, whose object is to elevate the lid and thus open the eye; while there is another muscle, the *orbicularis palpebrarum*, which surrounds the orbit and eyelids and by its contraction closes the eye. The Meibomian glands secrete a sebaceous matter, which facilitates the free motion of the lids and prevents their adhesion. The eyelashes intercept the entrance of foreign particles directed against the eye and assist in shading that organ from an excess of light.

The *lachrymal apparatus* consists of the lachrymal gland, by which the tears are secreted; two canals, into which the tears are received near the inner angle of the eye; the sac, into which these canals open; and the duct, through which the tears pass from the sac into the nose. The gland is an oblong body, about the size of a small almond, lying in a depression in the upper and outer part of the orbit. The fluid secreted by it reaches the surface of the eye by seven or eight ducts, which open on the conjunctiva at its upper and outer part. The constant motion of the upper eyelid induces a continuous gentle current of tears over the surface, which carry away any foreign particles that may have been deposited on it. The fluid then passes through two small openings (termed the *puncta lachrymalia*) into the canals; whence its further course into the lower portion of the nose is through the lachrymal duct. The conjunctiva (or mucous coat), which covers the front of the eyeball and lines the inner surface of the lids, passes down and lines the canals, sac, and duct, and is thus seen to be continuous with the nasal mucous membrane, of which it may be regarded as an offshoot or digital prolongation. See MUCOUS MEMBRANES.

We shall conclude this sketch of the anatomy of the human eye with a brief mention of the *nerves* going to this organ and its appendages. Into each orbit there enters a nerve of *special sense*, viz., the optic nerve; a nerve of *ordinary sensation*, viz., the ophthalmic branch of the fifth nerve; and certain nerves of *motion* going to the muscular tissues and regulating the movements of the various parts, viz., the third, fourth, and sixth nerves. As the optic tracts from which the *optic nerves* originate are noticed in the article NERVOUS SYSTEM, we shall merely trace these nerves from their *chiasma*, or commissure, forward. This commissure results from the junction of the optic tracts of the two sides, and it is especially remarkable for the fact that it presents a partial decussation of the nervous fibres, the central fibres of each tract passing into the nerve of the *opposite* side, and crossing the corresponding fibres of the other tract; while the outermost fibres, which are much fewer in number than the central ones, pass to the optic nerve of the *same* side. In front of the commissure the nerves enter the optic foramen at the apex of the orbit, receive a sheath or investment from the *dura mater*, acquire increased firmness, and finally terminate in the retina. The peculiar mode of termination of the optic nerves in the cuplike expansion of the retina, the impairment or loss of vision which follows any morbid affection of them, and the constant relation in size which is observed in comparative anatomy between them and the organs of vision, afford sufficient evidence that they are the proper conductors of visual impressions to the sensorium.

The first or ophthalmic division of the trifacial nerve sends branches to the skin of the eyelids and to the conjunctiva. It is the nerve of ordinary sensation of the eye. The most important of the nerves of motion of the eye is the third nerve, or *motor oculi*. It supplies with motor power the elevator of the upper eyelid and all the muscles of the globe, except the superior oblique and the external rectus muscle, and, in addition to this, it sends filaments to the iris and other muscular fibres within the eye. Irritation of its trunk induces convulsive contraction of the principal muscles of the ball and of the iris; while division of the trunk occasions an external squint, with paralysis of the upper eyelid and fixed dilatation of the pupil. The squint is caused by the action of the external straight and the superior oblique muscles, while the other muscles are paralyzed by the operation. The normal motor action of the nerve upon the iris in causing contraction of the pupil is excited through the optic nerve and affords a good illustration of *reflex action*, the stimulus of light falling upon the retina and, through it, exciting that portion of the brain from which the third nerve takes its origin. This nerve exerts a double influence in relation to vision: (1) it mainly controls the movements of the eyeball and the upper eyelid; and (2) from its connection with the muscular structures in the interior it regulates the amount of light that can enter the pupil and probably takes part in the adjusting power of the eye to various distances.

The fourth nerve supplies the superior oblique muscle, the sixth nerve regulates the movements of the external rectus—the only two muscles in the orbit which are not supplied by the third pair. The facial nerve sends a motor branch to the *orbicularis* muscle, by which the eye is closed.

Physiology. A general knowledge of the ordinary laws of geometrical optics (see LIGHT; LENS; ETC.) is assumed. If a luminous object—as, e.g., a lighted candle—be placed at about the ordinary distance of distinct vision (about 10 inches) from the front of the eye, some rays fall on the sclerotic and, being reflected, take no part in vision. The more central ones fall upon the cornea, and of these some also are reflected, giving to the surface of the eye its characteristic glistening appearance; while others pass through it, are converged by it, and enter the aqueous humor, which probably exerts no perceptible effect on their direction. Those which fall on and pass through the outer part of the cornea are stopped by the iris, and are either reflected or absorbed; while those which fall upon its more central part pass through the pupil and are concerned in vision. In consequence of its refractive power the rays passing through a comparatively large surface of the cornea are converged so as to pass through the relatively small pupil and impinge upon the lens, which, by the convexity of its surface and by its greater density towards the centre, increases the convergence of the rays passing through it. They then traverse the vitreous humor, whose principal use appears to be to afford support to the retina, and are brought to a focus upon that tunic, forming there an inverted image of the object.

This inversion of the image may be easily exhibited in the eye of a white rabbit or other albino, after removing the muscles, etc., from the back part of the globe. The flame of a candle held before the cornea may be seen inverted at the back of the eye, increasing in size as the candle is brought near, diminishing as it retires, and always moving in a direction opposite to that of the flame.

The adaptation of the eye to distinct vision at every distance beyond that of a few inches is brought about by a process known as *accommodation*. The essential factor in the process is the contraction of the ciliary muscle, which, as previously noted, allows the suspensory ligament of the lens to relax, with a resultant bulge of its anterior surface and a decrease in its focal length. According to Helmholtz, the radius of curvature of the anterior surface of the lens diminishes on turning the eye to a near object from 10 to 6 millimeters (from about 0.4 to 0.24 of an inch), while the most projecting point of the same surface is brought forward about 0.2 of an inch. According to the observations of Hueck, the focal distance may be changed about three times in a second. The accommodation from a near to a distant object is effected much more rapidly than the converse process.

There are two forms of defective vision in which this power of adaptation is very much limited—viz., shortsightedness, or *myopia*, and longsightedness, or *hypermetropia*. The limitation, however, is not due to a defect in the muscular apparatus to which we have referred, but to an abnormality either in the curves of the refracting media or to congenital or acquired changes in the anteroposterior diameter of the eyeball. In *shortsightedness* from too great a refractive power from either cause, the rays from objects at the ordinary range of distinct vision are brought too soon to a focus, so as to cross one another, and begin to diverge before they fall on the retina, the eye in this case being able to bring to the proper focus on the retina only those rays which were previously diverging at a large angle from a very near object. The correction for this deficiency is accomplished by interposing between the eye and indistinctly seen objects a *concave* lens, with a curvature just sufficient to throw the images of external objects at the ordinary distance of distinct vision backward upon the retina. In *farsightedness*, on the other hand, there is an abnormal diminution of the refractive power from too flat a cornea, a deficient aqueous humor, or a flattening of the lens, so that the focus is behind the retina. This defect is corrected by *convex* lenses, which increase the convergence of the rays of light. Presbyopia, as its name indicates, usually comes on at a comparatively advanced period of life and is due to senile changes affecting the elasticity of the lens and its attachments.

We have already noted the most essential use of the iris—viz., its power, under the influence of light upon the retina, of modifying the size of the pupil so as to regulate the amount of light entering the eye. But this is not its only use, one of its offices being to prevent the passage of rays through the circumferential part of the lens, and thus to obviate the indistinctness of vision which would arise from *spherical aberration* (the unequal refraction of the rays passing through the centre and near the margin of the lens), in the same manner as the diaphragms employed by the optician. But there are two other means by which this spherical aberration is prevented, which admirably illustrate the marvelous mechanism of the eye. They are described by Wharton Jones as follows:

1. "The surfaces of the dioptric parts of the eye are not spherical, but those of the cornea and posterior surface of the lens are hyperbolical, and that of the anterior surface of the lens elliptical—configurations found by theory fitted to prevent spherical aberration. This discovery was made at a time when it was not known but that the dioptric parts of the eye had spherical surfaces.

2. "The density of the lens diminishing from the centre to its periphery, the circumferential rays are less refracted than they would have been by a homogeneous lens with similar surfaces."

Chromatic aberration, which is caused by the unequal refrangibility of the primitive rays of which white light is composed, when transmitted through an ordinary lens, whereby colored fringes are produced, is *practically* corrected in the eye, although it is doubtful whether it is *entirely* absent. The provision, however, on which the achromatism depends has not been determined with certainty, probably because we do not yet know the relative refractive and dispersive powers of the cornea and humors of the eye. Sir David Brewster denies that the chromatic aberration receives any correction in the eye and maintains that it is imperceptible only in consequence of its being extremely slight. See also VISION.

EYE. A loop, ring, or hole through a substance; also direction, as *in the wind's eye*. The extreme forward part of a ship is called *the eyes of the ship*. Chinese junks and other native craft have blocks of wood shaped and painted to resemble human eyes placed on each side of the bow, and the hawse holes of ships of Europe and America are sometimes compared to eyes and may at one time have been so called. The *eyes* of the rigging are loops formed in the shrouds or stays for fitting around the mastheads. A *deadeye* is a block of hard wood (usually lignum vitæ) pierced with several holes. Two deadeyes are made to form a sort of tackle by reeving a rope through them; in rigged ships of old type the lower ends of shrouds and stays were secured to such tackles, which were kept in place permanently. An *eyebolt* is a bolt that has a projecting end formed in the shape of a ring for the purpose of hooking a tackle or attaching a rope. *Eyelets*, or eyelet holes, are small circular holes in sails, awnings, etc., through which pass small ropes. An *eye-splice* is an eye formed at the end of a rope by separating the strands at the end and sticking them between the strands in a special manner at the proper place.

EYE, COMPARATIVE ANATOMY OF THE. How far down in the scale it is necessary to go to find animals which have no eyes depends upon whether we mean by "eye" an organ capable of forming optical images, or simply an organ capable of responding to the stimulus of light. If the latter is really an eye, then we are justified in saying that all the large groups of animals higher than sponges have eyes, though many families and even some orders may lack them. Among cœlenterates, simple light-detecting organs, known as pigment spots, or "pigment eyes," and consisting of groups of pigment cells associated with sensory cells, occur in many medusæ and in ctenophores. In some cases the cuticle over these spots is specially thickened to form a sort of lens. Similar pigment eyes occur among the flatworms (*Platoda*), and in some cases they are somewhat more complicated by the addition of so-called retinal cells with rodlike processes. It is very doubtful, however, whether these eyes are really anything more than light-detecting organs. Pigment eyes very similar to these, though often somewhat more complicated, occur in many worms, crustaceans, insects, and mollusks, and in a few echinoderms. The eyes of tunicates and of *Amphioxus* are not of any higher degree of organization. In crustaceans the pigment eye is known as the "unpaired" eye and is apparently made up of three simple eyes fused together. In insects the pigment eyes are called "ocelli," and these also occur in spiders and scorpions. Pigment eyes are of service to their possessors in enabling them to distinguish between light and shade and in detecting different degrees of light. Thus, shadows cast by an approaching enemy would be noticed, and, in aquatic animals, approach to the surface would be quickly indicated.

Turning now to those organs which unquestionably form some sort of image, we find there are two very distinct kinds—"simple" and "compound" eyes. Simple eyes correspond in structure to a greater or less degree with the eye of man, while compound eyes are of a totally different kind. The latter are found only among arthropods, where they reach a high degree of development, the so-called compound eyes of some mollusks and sea urchins being really much less complex. In arthropods the optic nerve bears two noticeable swellings—the optic ganglion, really a part of the brain, and the retinal ganglion, from which radiate the nerve fibres, entering the retinal cells. The retinal cells are grouped in clusters of four to seven, known as "retinulæ," which are more or less heavily pigmented distally. Each retinula is the basal part of a single eye, the upper portion of which consists of a crystal cone (wanting in the eyes of many insects) and of hypodermal elements covered with the chitinous cuticle developed as a cornea. These single eyes are crowded together, though separated from each other by pigment cells, on a strongly convex basal membrane, thus forming a more or less convex compound eye. Rays of light falling on the eye are absorbed without giving rise to a visual stimulus, except such as are directly parallel to the long axis of the single eyes. Each of these eyes therefore forms an image of that which lies directly before it, and the whole compound eye thus forms a mosaic, probably with sharp outlines, but wholly lacking perspective.

Image-Forming Eyes. Such are first found in the animal kingdom in the group of Cubomedusæ, where, especially in the genus *Charybdea*, each individual possesses several quite complex eyes provided with lens, vitreous body, and retina. Many worms have very well-formed and often large eyes. It is among mollusks that we find the best-developed eyes among invertebrates. The eyes of dibranchiate cephalopods, as the squid, have a very complex structure, all of the parts essential to good sight in man's eye being present. There is, however, one very important difference between the cephalopod and the vertebrate eye, and that is that in the former the retinal-cell rods lie inside the limiting membrane and are thus turned towards the light, while in vertebrates these visual rods are turned away from the light. In some mollusks, with much simpler eyes, the retinal-cell rods are turned away from the light, as in vertebrates.

Eye in Vertebrates. Passing now to the consideration of the vertebrate eye, we find that the structure is in all cases essentially similar to that of the human eye, though many cases of degenerate eyes are known, associated with some peculiarities of habit, as, in the hagfish, with a parasitic mode of life; or, as in the cave salamanders and fishes, with living in the dark. (See CAVE ANIMALS.) In fishes the eyes have little power of movement, the cornea is very flat, and the lens is globular; the eyes are thus accommodated, when at rest, for seeing *near* objects. The sclerotic is frequently calcified or ossified, and there is no ciliary muscle. In amphibians the eyes are somewhat simpler than in fishes, but the ciliary muscle is present as in all higher vertebrates. In both fishes and amphibians we find examples of angular pupils. In reptiles the eye shows slight advance in structure, in respect to some special peculiarities; thus, in lizards there is a ring of bony sclerotic plates, and a curious structure, the "pecten" (also present in snakes, crocodilians, and especially in birds), the function of which is in dispute, some saying it is concerned solely with the nutrition of the eye, others that it aids in accommodation. In birds the eyeball is not nearly spherical (as in other vertebrates), but is elongated so that it is much deeper than high. This is most marked in owls. In mammals the sclerotic is entirely fibrous, the external surface of the lens is less convex than the internal, and there is no pecten. The pupil is variously shaped. In aquatic mammals the cornea is flattened as in fishes.

Bibliography. Lang, *Text-Book of Comparative Anatomy* (New York, 1896); Wiedersheim, *Vergleichende Anatomie der Wirbelthiere* (Jena, 1902), contains a bibliography; Carrière, *Die Sehorgane der Thiere* (Munich, 1885); Gegenbaur, *Vergleichende Anatomie der Wirbelthiere* (Leipzig, 1898).

EYE, DISEASES OF THE. The diseases of the eye are very numerous, owing to the variety of the tissues and parts of which the eye is formed. Nearly all its parts are liable to inflammation and its consequences. (See OPHTHALMIA; RETINITIS.) The eyelids are liable to various diseases, morbid growths, most of which the surgeon may remove, and inflammation (see BLEPHARITIS; STYE); they may be misdirected inward or outward, *entropion* and *ectropion* (qq.v.); and the upper eyelid may droop (*ptosis*) from paralysis of the motor oculi nerve, increased weight of the lid, or atrophy or loss of the eyeball. The eyelashes may grow in upon the eye (*trichiasis*, q.v.) and produce serious results. The duct whose function is to convey the tears to the nose is liable to inflammation and obstruction. (See LACHRYMAL ORGANS.) The cornea is liable to ulceration and opacity in various degrees. (See CORNEA.) Collections of pus (*hypopyon*) are found in the anterior chamber, as the result of corneal ulceration and iritis. (For inflammation of the mucous membrane covering the eyeball and eyelids, see Conjunctivitis.) The pupil may be closed as the result of iritis (q.v.) or of operations for cataract. (For opacities of the crystalline lens, see Cataract. For an account of inflammation of the optic nerve, see Optic Neuritis.) An important disease of the eye is glaucoma (q.v.). Various affections of vision may arise from peculiar or altered conditions of refraction, changes in the nerves, or in the action of the muscles moving the eyeball. (See Sight, Defects of.) The parts between the eye and its bony orbit may be the seat of inflammation, abscess, or tumor, making the eye protrude. The movements of the eyeballs may be affected from paralysis of the motor nerves, or from contraction or weakness of the muscles, causing squinting. (See Strabismus.) The eye may become insensible from paralysis of the fifth pair of nerves. Substances thrown against the eye may injure it. If a caustic alkaline substance has entered the eye, weak vinegar or milk is the best thing to introduce until the physician arrives. If oil of vitriol (sulphuric acid) has been the cause of the injury, a weak solution of soda may be used in the first place to neutralize the acid. In gunpowder explosions near the eye, besides the burn, the particles are driven into the surface of it and will cause permanent bluish stains over the white of the eye unless they are carefully removed at the time. When chips of glass, stone, etc., are driven into the interior of the eye, there is great danger of destructive inflammation and sympathetic ophthalmia. (See Ophthalmia.) Commonly foreign bodies, as dust, sand, seeds, flies, etc., enter the space between the eyeball and the lids, almost always concealed under the upper, as it is the larger and sweeps the eye. They cause great pain, from the firmness and sensitiveness of the papillary surface of the lid, soon excite inflammation, and their presence is apt to be overlooked. The lid must be turned over to find them. To do this, pull the edge of the lid forward by the eyelashes and at the same time press down the back part of the lid with the tip of the left forefinger or with a small pencil or key. The lid will readily turn over, when the body may be seen and removed with a corner of a handkerchief. In other cases a solution of cocaine must be instilled and a needle used to dislodge the particle. After removal irritation may persist for some time. Particles of steel penetrating the interior of the eyeball may be removed by means of a powerful magnet, often with comparatively little damage to sight. Consult May, *Manual of Diseases of the Eye* (New York, 1909), and Weeks, *Diseases of the Eye* (Philadelphia, 1912).

EYE, ī′*e*, August von (1825–96). A German art historian, born at Fürstenau, Hanover. He was educated at Göttingen and Berlin, and in 1853 was appointed superintendent of the department of art and antiquities in the Germanic Museum, Nuremberg; in 1875 became professor in the School of Decorative Arts, Dresden; and in 1879 he emigrated to Brazil, returning after a few years to settle at Nordhausen. He wrote valuable works on ancient and modern art and on philosophical subjects. The best known of his works is his *Leben und Werke Albrecht Dürers* (Nördlingen, 1860; 2d ed., 1869). He also edited a number of illustrated works treating the history of art and culture, including: *Kunst und Leben der Vorzeit* (Nuremberg, 1868); *Gallerie der Meisterwerke altdeutscher Holzschneidekunst* (ib., 1858–61), written in collaboration with Jacob Falke; *Deutschland vor 300 Jahren in Leben und Kunst* (Leipzig, 1857); *Die neue Weltauschanung* (ib., 1891); *Albrecht Dürers Leben und künstlerische Tätigkeit* (Wandsbeck, 1892). His principal philosophical work is *Das Reich des Schönen* (Berlin, 1878).

EYE OF GREECE. An ancient epithet of Athens.

EYE′PIECE′, or Ocular. The lens or lenses by means of which the image of the object formed at the focus of a telescope or microscope is observed. See Telescope; Microscope.

There are two forms of eyepieces in general use, each of which possesses advantages for certain classes of work. In the Ramsden eyepiece there are two planoconvex lenses of equal focus placed with their curved sides towards each other. As the image is formed beyond the lenses, this eyepiece can be used in micrometer microscopes. (See Micrometers.) In the Huygenian eyepiece there are two planoconvex lenses, the lower of which has a focal length several times greater than that of the upper. The curved face of the upper lens faces towards the plane face of the lower, and the image is formed between the two. Consult Carpenter, *The Microscope* (8th ed., Philadelphia, 1901).

EYERMAN, ī′ẽr-*man*, John (1867–). An American geologist and genealogical writer. He was born at Easton, Pa., of Pennsylvania Dutch ancestry, was educated at Lafayette College, and continued his studies at Harvard and Princeton universities. He was a lecturer on determinative mineralogy at Lafayette College, and in 1890 became associate editor of the *American Geologist*. His publications include: *The Mineralogy of Pennsylvania* (1891); *A Course in Determinative Mineralogy* (1892); *The Old Graveyards of Northampton* (2 vols., 1899–1901); *Some Letters and Documents* (2 vols., 1900); *Genealogical Studies* (1902).

EYE STRAIN. A term for the result of using the eyes under improper conditions; an important cause of waste of nerve force, frequently the reason for neurasthenia, headache, chorea, hysteria, convulsions, and dementia. It may be occasioned by the need of glasses or by the use of improper glasses, but is often produced by lack of balance of the ocular muscles. Proper glasses or ocular tenotomy constitute the remedy.

EYETEETH, also called Canine or Cuspidate Teeth. The two teeth in the upper jaw next to the premolars, one on each side, the fangs of which extend far upward in the direction of the eye. See Teeth.

EYLAU, ī′lou, or **PREUSSISCH-EYLAU**, proi′sĭsh-ī′lou. A town of some 3000 inhabitants, situated on the Pasmar, about 24 miles south of Königsberg, Prussia. It is noted as the scene of a sanguinary battle between the French under Napoleon and a combined force of Russians and Prussians under Bennigsen and Lestocq, Feb. 7–8, 1807, which took place during the war with Prussia which marked the close of the struggle of Napoleon with the Third Coalition (1805–07). On the night of February 7 the French army came in touch with the rear guard of the Russians at Eylau. After a murderous fight, during which the Russian position was thrice taken and lost, Soult succeeded in driving the enemy from the town. The following morning found the two armies drawn up at close range. Soult held the left wing of the French army; in the centre was the corps of Augereau; on the right flank was the division of Saint-Hilaire. Behind Augereau was Murat with his cavalry. On the extreme left and some 10 miles in advance of the main battle line was the corps of Ney, engaged in hot pursuit of 8000 Prussians under Lestocq. On the extreme right and also in advance was the corps of Davout. It was Napoleon's intention to throw Davout's forces against the extreme left flank of the Russians and by pressing it back upon the centre to send the entire hostile army flying in confusion towards Königsberg, where they would be intercepted by Ney. The plan miscarried, however, for Davout, delayed by a blinding snowstorm, did not deliver his attack before 1 o'clock in the afternoon. The battle began early in the morning with a furious cannonade, lasting several hours. Augereau's corps was then sent against the Russian centre, but was met with a terrific cannon fire and was almost annihilated. For a time the centre of the French army was threatened, and, to save the day, Murat's cavalry was hurled against the advancing forces of the Russians. They drove back the Russian cavalry, broke through the first two lines of infantry, but recoiled before the third, and could only regain their position by cutting their way through the lines of the enemy which had formed again behind them. Davout finally struck the enemy's left and succeeded in driving them from their position, and it seemed as if in spite of delay Napoleon's plan would be carried out after all. But at three o'clock in the afternoon Lestocq, who had succeeded in escaping from Ney, arrived on the battlefield with 5500 men and, passing in the rear of the entire Russian army, assailed Davout with his fresh troops. Davout's forces were slowly pushed back from the most advanced of the positions they had captured, but both sides were soon too exhausted to do more than hold each other in check. Late at night Ney arrived on the field, too late to bring victory to the French, but still in time to prevent a defeat which might have resulted from a concerted move on the part of the Russians. The numbers engaged were about 70,000 on either side. The losses were 18,000 for the Russians and Prussians and somewhat more for the French. Against the advice of his lieutenants, Bennigsen retreated during the night, leaving the French masters of the field. Direct results the battle had none, and Eylau has passed into history as a huge, profitless carnage. Indirectly, however, it strengthened the enemies of Napoleon by breaking the charm of his seeming invincibility. Napoleon had failed for the first time in a pitched battle, and his diplomatic standing suffered in consequence. A few days after the battle he started negotiations for peace with Frederick William. He was willing to surrender claim to all Prussian territory east of the Elbe and not to ask Prussia to help him in war with Russia. Prussia, through Hardenbergh, refused these terms. Napoleon then proposed an armistice for joint negotiations, a move which indicated his critical position. Consult: Oncken, *Das Zeitalter der Revolution, des Kaiserreichs und der Befreiungskriege* (2 vols., Berlin, 1884–87); Von Schachtmeyer, *Die Schlacht bei preussisch Eylau* (ib., 1857); Duncker, *Abhandlungen aus der neueren Geschichte* (Leipzig, 1887); M. Dumas, *Précis des événements militaires de 1799 à 1814* (19 vols., Paris, 1816–26).

EYLAYET. See VILAYET.

EYMER'ICUS, NICOLAS (1320–99). A Spanish theologian. He was born at Gerona, Catalonia, and entered the Dominican Order in 1334, rising to the rank of Grand Inquisitor, chaplain of Pope Gregory XI, and judge of heretics, in 1356. He lived successively in Aragon and Avignon, where he enjoyed the fullest confidence of Clement VI and his successor, Benedict XIII. He was considered the greatest canonist of his time and wrote the famous *Directorium Inquisitorum* (1503), which laid down the regulative maxims for inquisitors. Although very harsh, it was not enough so for Torquemada, who promulgated in 1484 a new code of procedure.

EYNARD, ā'nȧr', JEAN GABRIEL (1775–1863). A French banker, interested in the cause of Greek independence. He was born at Lyons, took part in the Lyons rising against the Convention, lived in Switzerland and then in Genoa, where he grew rich, and settled at Geneva in 1810. He was the Ambassador of the Republic of Geneva to the Congress of Vienna and in 1816 was appointed to assist in organizing the administration of Tuscany. He was the delegate of Tuscany at the Congress of Aix-la-Chapelle in 1818. In 1821 he became one of the foremost advocates of Greek independence and for his services was naturalized as a Greek citizen. He did not succeed in negotiating a loan for the revolutionary government in Paris and London, but personally contributed 700,000 francs. After conducting a sort of crusade throughout western Europe in behalf of the Greeks, he was instrumental in securing the throne of Greece for Otho of Bavaria. His fortune of 60,000,000 francs was bequeathed largely to charitable enterprises. He wrote *Lettres et documents officiels relatifs aux divers événements de Grèce* (1831) and *Vie de la baronne Krüdener* (1849). Consult Rothpletz, *Der Genfer Jean Gabriel Eynard als Philhellene* (Zürich, 1900).

EYRA, ā'rȧ (South American name). A remarkable cat (*Felis eyra*) of eastern South America, Central America, and Mexico. It is about the size of the domestic cat, but its legs are much shorter, and its body, neck, and head so slender and elongated as to present a striking similarity in form to a civet, increased by the extraordinary length and thickness of its tail. The pupil of the eye is round, the ears rounded, and the muzzle compressed. The fur is soft, of a uniform reddish-yellow or chestnut color, with a whitish spot on each side of the upper lip and on the chin. It is most common in Brazil and Paraguay, but is known as far north as the borders of the United States. This is the cat to which the name represented by our word "cougar" (see COUGAR) was first applied; and it is known in Mexico as "apache." It seems easily capable of domestication, since the few specimens kept in zoölogical gardens have quickly become gentle and playful and sometimes have been at liberty about the buildings; and it is therefore sometimes adopted into the homes of the South Americans, but is likely to be mischievous to poultry. Eyras are expert hunters for small mammals and birds. Consult Azara, *Historia Natural de los Pájaros del Paraguay,* *eta.* (Madrid, 1805), and Alston, "Mammals," in *Biologia Centrali-Americana* (London, 1879). See Plate of Wild Cats with Cat.

EYRE, âr. A large salt lake in the northeastern part of the State of South Australia. It is the centre of the Salt Lake River system, the rivers belonging to which either rise in the southern and western slopes of the Great Dividing Range, or in the central group of the McDonnell ranges. They discharge into Lake Eyre through many devious channels so connected as to form a perfect network of interlacing watercourses. The lake (which receives most of the rivers of Central Australia) is 80 miles long by 40 wide, and its surface, below sea level, oscillates considerably between the wet season, when the rivers are bank-full, and the dry season, when much of the area is an arid desert.

EYRE, âr (Scottish variants also *air, aire,* from AF. *eire,* OF. *erre, oire,* journey, from Lat. *iter,* road), or Eire, Justices in (corruption of Lat. *in itinere*). Itinerant, or, as we should say, circuit judges. By this term, both in England and Scotland, the judges of assize (q.v.) were formerly designated. Justices in eyre were first regularly established in England by Henry II, in the sixteenth year of his reign (1170). The inconveniences and the denials of justice resulting from the infrequency and irregularity of the royal progresses, at which justice was dispensed by the Curia Regis, throughout the kingdom, called for the institution of a different system. Accordingly, Henry appointed 12 justices to perambulate all the counties of England regularly and to hear the complaints of his subjects. The number of these itinerant judges was in 1176 increased to 18, and at the Grand Council at Windsor in 1179, to 21. The subsequent rapid development of the regular common-law courts, which resulted from the division of the Curia Regis and the institution of circuits regularly held by these, gradually threw the courts of the justices in eyre into the shade. They came to be regarded as of inferior position and authority and in 1335 ceased to be appointed. Thereafter the expression had no precise meaning in England, but was sometimes loosely employed to describe the judges of the King's Bench, Common Pleas, and Exchequer, when on circuit.

In Scotland the chief justiciar, says Erskine, i, 3, s. 25, was originally bound to hold yearly two justice courts or "aires" at Edinburgh and Peebles. This court gradually became fixed at Edinburgh. Besides this court, special "justice aires" were frequently held in the more remote parts of the country by the King in person, or by judges named by him, twice in the year—in spring and autumn (Stat. Rob. III, 1400, c. 30). These courts were discontinued, but revived by Statute of 1587, c. 81. The term is still in use in Scotland, where at the commencement of every circuit, proclamation is made to the lieges to attend the "circuit aire." See Circuit; Curia Regis; Court, and the authorities there referred to.

EYRE, âr, Edward John (1815–1901). An English explorer and colonial governor. He was born in Yorkshire, England, but at 17 emigrated to Australia, where he soon became a magistrate and in 1845 published *Discoveries in Central Australia.* For his achievements he was honored by the Royal Geographical Society and received the appointment of Lieutenant Governor of New Zealand in 1846 and of St. Vincent in 1854. In 1864, after being acting Governor, he was made actual Governor of Jamaica, where in 1865 he used vigorous measures to suppress a negro insurrection. For the execution by court-martial of Gordon, who was thought to be one of the leaders, Eyre was censured and recalled on the ground that he had acted without sufficient evidence. On his return he was prosecuted for murder by a committee, of which John Stuart Mill was the most prominent member; but the charge was eventually dismissed, partly on the ground that the Jamaica Act of 1866 (which indemnified Eyre for his acts during the rising) protected him from civil suit or criminal prosecution. Ruskin, Tennyson, Thomas Carlyle, and Charles Kingsley were ardent defenders of Eyre, who retired from public service in 1874. Consult Hume's *Life of Edward John Eyre* (London, 1867).

EYRE, Sir James (1734–99). An English judge, the son of Rev. Thomas Eyre, prebendary of Salisbury. He was born at Wells, Somersetshire, in 1734; became a scholar of Winchester in 1747, and a student of St. John's College, Oxford, in 1749. At the age of 19, without waiting to take his degree, he went to London and commenced to study law, being called to the bar in 1755. A few years later he became counsel to the Corporation of London, and in 1763 was made recorder. In the same year he gained a great reputation through the skill and eloquence with which he conducted the famous suit of Wilkes *v.* Wood, in which he successfully attacked the unconstitutional practice of the government in issuing general search warrants. (*State Trials,* xix. 1154.)

Eyre was knighted and made Baron of the Exchequer in 1772, became Chief Baron in 1787, and in 1793 was appointed Chief Justice of the Court of Common Pleas. In the latter capacity he presided at the famous state trials of Hardy, Horne Tooke, and others, for treasonable conspiracy, which resulted in the acquittal of the prisoners. For a short time, between the resignation of Lord Chancellor Thurlow, on June 15, 1792, and the accession of Lord Loughborough to the chancellorship on Jan. 21, 1793, Chief Justice Eyre held the highest judicial position in England, as Chief Commissioner of the Great Seal. As a lawyer and as judge he displayed the highest legal and judicial qualities. Though not profoundly learned, he was well versed in the common law, and his patience, tact, and ingenuity, combined with an extraordinary power of sifting evidence and a luminous style, made him one of the ornaments of the English bench. He died July 1, 1799. Consult Howell's *State Trials,* xix, 1154–55; xxiv, 199; xxv, 2, 748 (London, 1809–26), and Foss, *Lives of the Judges of England* (1848–64).

EYRE, Jane. See Jane Eyre.

EYRE, Sir Robert (1666–1735). An English judge, son of Sir Samuel Eyre, of Newhouse, Wiltshire, who was himself a judge of the King's Bench. Robert was born in 1666, entered Lincoln's Inn in 1683, and was admitted to the bar in 1689. Seven years later he became recorder of Salisbury, and from 1698 to 1710 represented that borough in Parliament. In 1707 he became Queen's counsel and the next year was appointed Solicitor-General. In that capacity it fell to his lot to conduct the celebrated Sacheverell case. He was knighted and made a justice of the Queen's Bench in 1710. He became Chief Baron of the Court of Exchequer in 1723 and Chief Justice of the Common Pleas in 1725. Having been accused of official misconduct in connection with a case of malfeasance tried before him, his conduct was investigated by a committee of the House of Commons, which completely exonerated him. He was the intimate friend and associate of the great men of his time, and wielded considerable influence at court, but he never attained to the first rank among English judges. He died in 1735. Consult: Howell's *State Trials*, xv, xvii (London, 1809–26); Burnet, *History of his own Time* (ib., 1723–34); Foss, *Lives of the Judges of England* (ib., 1848–64).

EYRE, Wilson (1858–). An American architect, born in Florence, Italy. He was educated in Italy until 1869, then at Newport, R. I., for three years, at Lenoxville, Canada, for two years, and finally he graduated from the Massachusetts Institute of Technology in 1876. After spending five years with James P. Sims, architect, he was in independent practice from 1881 to 1912 and then became the partner (senior) of John Gilbert McIlvaine. He planned buildings for the Newcomb Memorial College, New Orleans, and the Detroit Club, Detroit, Mich.; many structures in Philadelphia and New York; and numerous country houses of unusual artistic merit. In 1910 he became an Associate National Academician and a member of the American Institute of Architects.

EYTELWEIN, ī'tel-vīn, Johann Albert (1764–1848). A German engineer, born in Frankfort-on-the-Main. He was appointed director of the architectural school in Berlin, upon the opening of that institution in 1799. He conducted the hydraulic operations for the improvement of navigation on the Warthe, Weichsel, Oder, and Niemen; built the harbor extensions of Memel, Pillau, and Swinemünde; determined the boundaries of the Rhine Province; and established a system of weights and measures for Prussia. His principal works are the following: *Praktische Anweisung zur Bauart der Faschinenwerke an Flüssen und Strömen* (2d ed., 1818); *Vergleichung der in den preussischen Staaten eingeführten Masse und Gewichte* (2d ed., 1810); *Handbuch der Statistik fester Körper* (2d ed., 1832); *Handbuch der Hydrostatik* (1826); *Auflösung der hohern numerischen Gleichungen* (1837).

EYTH, īt, Max (1836–1906). A German engineer and author, born at Kirchheim-unter-Teck. In 1861 he became engineer in Fowler's manufactory of agricultural implements at Leeds, for which he traveled extensively abroad. He was chief engineer of Halim Pasha from 1863 to 1866, during which years the steam plow was introduced into Egypt. He was one of the founders of the German Agricultural Society. His principal works include: *Das Agrikulturwesen in Aegypten* (1867); *Steam Cable Towing* (1868); *Das Wasser im alten und neuen Aegypten* (1891); *Wanderbuch eines Ingenieurs: In Briefen* (1871–84), an interesting illustrated description of his travels; *Volkmar* (3d ed., 1876), an historical poem; *Mönch und Landsknecht* (2d ed., 1886); *Lebendige Kräfte* (1905).

EYTINGE, ī'tĭng, Rose (1838–1911). An American actress and author, born in Philadelphia. From 1862 to 1869 she played in various theatres in New York City and then went abroad with her second husband, Col. George H. Butler, Consul General to Egypt. On her return thence in 1871 she took the rôle of Cleopatra at the Broadway Theatre, to the Antony of Frederick Warde. Among her principal later parts were Nancy Sykes in *Oliver Twist*, Gervaise in *Drink*, Ophelia to the Hamlet of E. L. Davenport, and Desdemona with James W. Wallack as Othello and Davenport as Iago. Her literary works include adaptations of Dickens's *Oliver Twist* and *Dombey and Son*, Browning's *Colombe's Birthday*, her personal *Recollections*, published serially, and *Memories* (1905). Consult Clapp and Edgett, *Players of the Present* (Dunlap Society, New York, 1899), and Winter, *The Wallet of Time* (2 vols., ib., 1913).

EYUK, ā-yōōk'. A village in Asia Minor, built upon the small plateau of a hill, 75 miles west-southwest of Amasia. It has only about 30 houses, but is important as containing some of the most remarkable ruins in the East. They are the remains of a palace of enormous extent and consist of colossal walls and blocks of granite containing a great variety of sculptures, chiefly gods, processions, and religious rites, many of which are in an admirable state of preservation. The building is one of the most significant monuments left by the Hittites, whose art and architecture as illustrated in the palace at Eyuk are chiefly derived from Assyria, though betraying Egyptian influences. Eyuk is located only a short distance from Boghaz Kōi, which is now known, from the large finds of inscribed tablets made there by Winckler, to have been the ancient Hatti, capital of the Hittite Empire. (See Hittites.) Consult: Perrot, *Exploration de la Galatie et de la Bithynie* (Paris, 1872); Perrot and Chipiez, *History of Art in Sardinia, Judæa, Syria, and Asia Minor* (Eng. trans., London, 1890); Humann and Puchstein, *Reisen in Kleinasien und Nordsyrien* (Berlin, 1890); Garstang, *The Land of the Hittites* (New York, 1910); Olmstead, Charles, and Wrench, *Hittite Inscriptions* (1911); Winckler, *Nach Boghaz Kōi* (1914).

EYZAGUIRRE, ā'ē-thä-gē'rä, Agustin (1766–1837). A Chilean statesman. He was one of the principal leaders in the movement for national independence in 1810 and in 1813 was a member of the first national Junta. He was taken prisoner by the Spaniards at the battle of Rancagua in October, 1814, and was imprisoned on the island of Juan Fernández for three years. He was subsequently engaged in an enterprise for the establishment of trade between Chile and India. On the downfall of the O'Higgins administration in 1823 he was elected President of the provisional Junta and soon afterward was elected to the office of Vice President. On the resignation of President Freire (Sept. 10, 1826) he became acting President and retained this position until January, 1827, when he was deposed by a military mutiny.

EZE'KIEL (Heb. *Yeḥezqēl*, God makes strong). One of the four "greater" prophets. He was the son of the priest Buzi, a member of the Zadokite clan, which towards the close of the seventh century B.C. began to obtain complete control of the Yahwe cult in Jerusalem. He probably spent his youth in the temple at Jerusalem until the year 597 B.C., when, with Jehoiachin, King of Judah, and a large number of the people, he was carried captive to Babylonia by order of Nebuchadnezzar. There the Jews formed a separate community under the government of elders and engaged in agriculture. They probably paid a tax to the government, but in other ways were left unmolested. Ezekiel settled at Tel-Abib on the banks of the river Chebar. This river has been identified with the canal Kabaru mentioned in cuneiform documents of the time of Artaxerxes I (465–425 B.C.). It apparently lay somewhat to the east of Nippur (q.v.). He probably appeared as a prophet about the year 593 B.C. and continued to give oracles from time to time until 571 B.C. The date of his death is not recorded.

Ezekiel's life was short, as is evidenced by his book; but he spent his days in comforting and encouraging his people, while endeavoring to open their eyes to the real significance of current events and particularly of the national catastrophe with the resultant captivity of the people. Respected by the people, his influence was profound, though his task was a difficult one in rousing the masses, who were indifferent to the religious aspects of the situation. Ezekiel was essentially a priest. His interest is largely in matters connected with the ritual, but he also possesses the traits of a prophet. His imagination is impetuous, and features of his discourses are the visions, parables, and allegories with which they are filled. His style, while vigorous, lacks simplicity, and, on the whole, his moral tone, while strong, is also severe. He is a particularly interesting figure as representing the transition from the prophetic to the priestly period. His elaborate programme for the cult foreshadows the post-exilic history of Judaism which centres around the observance of the minutiæ of religious ceremonialism. See EZEKIEL, BOOK OF.

EZEKIEL, BOOK OF. The third of the so-called greater prophets. It is held by most scholars that the prophecies of Ezekiel have come down to us, as concerns the subject matter, substantially in the form in which the prophet himself left them, though doubts have recently been cast on this point. The Hebrew text has not been well preserved and contains many additions by scribes and changes which indicate that a revision was made subsequent to the prophet's death, or possibly more than one revision. By means of the Greek translation, which is based on a text varying considerably from the Hebrew, many of the original readings can be restored, and the Hebrew text otherwise improved. The book, consisting of 48 chapters, may be divided into four sections, the contents of which may be summarized as follows:

Part i (chaps. i–xxiv) consists of an introduction reciting the vision of Yahwe seated on a celestial chariot throne supported and set in motion by four creatures, each having four wings and the face, respectively, of a man, a lion, an ox, and an eagle. (See CHERUB.) From the mouth of Yahwe Ezekiel receives his call to the prophetic office, his commission to act as a guide to Israel. There follow prophecies against the people of Israel (chaps. iv–xxiv), subdivided into 18 sections: 1. The siege of Jerusalem, represented by a picture drawn on a tablet; the prolonged transgressions of the people; and the hardships they should suffer, by the eating of a coarse and loathsome bread. 2. Judgments on the city by famine, war, and dispersion abroad, signified by hair and beard cut off, weighed, scattered, and burned. 3. Judgments against idolatry, with a promise that a remnant should be saved. 4. Captivity, inevitable, and severe, under the emblem of a chain. 5. Transgressions of Judah, represented by the image of jealousy, and consequent judgments, typified by the scattering of fire, and the departure of the *shekinah*, or divine glory. 6. The captivity of Zedekiah, represented by the removal of household goods, and bread eaten with trembling. 7. False prophets reproved and threatened. 8. Idolatrous elders condemned. 9. The rejection of Jerusalem, represented by the burning of an unfruitful vine. 10. God's compassionate love, against which Israel had sinned, compared to kind care shown to a child cast out at its birth. 11. Judgments on Israel for turning to Egypt for help against Babylon, denounced under the emblem of two great eagles, one representing Nebuchadnezzar and the other Pharaoh. 12. Judgment denounced on every transgressor for his own sins, contrary to the common proverb implying that children suffer for their fathers' faults. 13. Captivity of the Jewish kings, represented by lions pursued and captured, and of the Jewish people, by a vine scorched, torn up, and planted in the wilderness. 14. God's mercies to Israel, and their continued transgression reviewed; and, while final forgiveness is promised to the penitent, impending judgments are declared. 15. A consumed forest represents Jerusalem destroyed, and a sharp sword, Nebuchadnezzar cutting down Ammonites and Jews. 16. Recital of sins committed in Jerusalem by all classes of the people, and judgments on them denounced. 17. Idolatries of Samaria and Jerusalem, and their punishment. 18. Dreadful destruction of Jerusalem again proclaimed.

Part ii consists of prophecies against various nations around Judæa (chaps. xxv–xxxii), subdivided into three sections: 1. Against the Ammonites, Moabites, Edomites, and Philistines. 2. Against Tyre (represented, in its beauty, wealth, and renown, as the anointed cherub on the mountain of God), with a promise of returning prosperity to Israel. 3. Against Egypt. In the last two prophecies Nebuchadnezzar is named as the instrument appointed to carry out God's purposes.

Part iii embodies the promises of future deliverance to Israel (chaps. xxxiii–xxxix), subdivided into five sections: 1. The prophet is compared to a watchman appointed to give warning of danger and is exhorted to be faithful. While under the power of the prophetic spirit, being informed that Jerusalem had been taken by Nebuchadnezzar, he foretells the desolation of the land and reproves the hypocrisy of the captives around him. 2. The rulers, civil and ecclesiastical, condemned as unfaithful shepherds, and a general restoration of the people promised under the guidance of the good shepherd, David the prince. 3. Judgments against Edom again foretold. 4. Promises of restoration renewed to Israel, under the emblems of fruitful mountains, sprinkled water, a new heart, dry bones raised to life, and two sticks united together. 5. Destruction of Gog, followed by blessings to Israel.

The fourth series of discourses (chaps. xl–xlviii), while forming part of the general picture of the restoration, is separated by its character from the rest of the book. It gives (1) an elaborate picture of the future temple, based apparently on the temple of Solomon; (2) a description of the altar and offerings; (3) the functions of the priest; (4) the territorial distribution of the tribes and boundaries of the land.

There are two features of Ezekiel's prophecies that are of special significance: (1) the visions, and (2) the descriptions of the temple cult. The former marks the beginning of that tendency in Jewish thought that led to the production of the extensive apocalyptic literature (q.v.), chiefly between the second century B.C. and the second century A.D. (See APOCRYPHA.) The latter stands midway between the Deuteronomic code and the final priestly legislation, for which it paves the way. Ezekiel's programme and general notions of the functions and privileges of the priest agree largely with the so-called Holiness Code (Lev. xvii–xxvi), though the latter is thought by many scholars to represent an even more advanced ritualistic standpoint. A notable difference, however, between Deuteronomy and Ezekiel is that, whereas according to the former all Levites are priests, according to Ezekiel only the Zadokites are recognized, while in the Holiness Code only descendants of Aaron are regarded as priests. Again, as regards festive seasons, Deuteronomy mentions three great festivals—Passover, Weeks, and Booths—whereas Ezekiel omits the second, but adds a special ceremony of purification for the first days of the first and seventh months, and the Holiness Code has, in addition to the three given in Deuteronomy, the Feast of Trumpets (the postexilic New Year's Day) and the Day of Atonement.

The direction thus given by Ezekiel to the elaboration of the cult was followed in succeeding generations. It is his spirit that pervades the perfected law (see EZRA; PENTATEUCH), and in a significant sense Ezekiel may be designated as the forerunner of that Judaism which centres around the temple cult and ceremonial minutiæ. This constitutes his main claim to an important position in Hebrew history. In moral sublimity and in eloquence he is surpassed by Isaiah and in profundity of feeling and the truest patriotism by Jeremiah. But it is Ezekiel who draws from the past, with its many tribulations and final catastrophe, the lesson that a future restoration must depend upon observance of Yahwe's decrees, and suggests, as their most important task, that the leaders determine in the most minute way what Yahwe has commanded and how he is to be worshiped, and then spare no efforts to have these regulations carried out. Salvation depends upon the temple cult, the constitution of a legitimate priesthood, and the strict obedience of the people to all such laws as are laid before it by its recognized religious leaders in the name of Yahwe.

Josephus (*Ant.*, x, 5, 1) declares that Ezekiel wrote and left behind him two books. It was supposed by Wildeboer, *De Letterkunde des Ouden Verbonds*, p. 296 (Groningen, 1893), that chaps. i–xxxix and xl–xlviii constitute these two books. Zunz, Geiger, Seinecke, Vernes, and most recently Torrey (*Transactions of the Connecticut Academy*, New Haven, 1909), have regarded the entire book as the product of a later time. Manchot (*Jahrbücher für protestantische Theologie*, xiv, 423 ff.) and Bertholet have questioned Ezek. xxvii. 9 b–25 a. Polychronius and Grotius regarded the prophecy against Gog and Magog (Ezek. xxxviii–xxxix) as referring to Antiochus III; Winckler (*Altorientalische Forschungen*, ii, 160 ff., Leipzig, 1893) interpreted it as occasioned by the career of Alexander; N. Schmidt (*Encyclopædia Biblica*, iv, 4332 f., New York, 1903) suggested that Mithradates VI of Pontus is the "prince of Meshech and Tubal." But, as a rule, the unity of the book is maintained by the interpreters. Consult the commentaries, particularly those of Smend, Keil, Davidson, Bertholet, Toy, Krätschmar, and the most recent ones by Lofthouse (Oxford, 1907) and Redpath (New York, 1907); also Cornill, *Das Buch des Propheten Ezechiel* (Leipzig, 1886); D. H. Müller, *Ezechielstudien* (Berlin, 1894); Jahn, *Das Buch Ezechiel auf Grund der Septuaginta hergestellt* (Leipzig, 1905); Herrmann, *Ezechielstudien* (ib., 1908).

EZEKIEL, MOSES JACOB (1844–1917). An American sculptor. He was born in Richmond, Va., was educated in his native city, and fought in the Civil War. In 1869 he entered the Academy of Art in Berlin, where he studied under Wolf, and in 1873 he received the Michael Beer prize for sculpture, the first American to obtain that distinction. He then went to Rome, where he continued to reside. His first large work was a group representing "Religious Liberty" (1874), which is now in Fairmount Park, Philadelphia. Among other works by him are the much-discussed "Christ," Peabody Institute, Baltimore; "The Daughter of Eve"; "Judith," Cincinnati Museum; a Madonna for a church in Tivoli; 11 statues of famous artists for the Corcoran Gallery, Washington; the Jefferson Monument in Louisville, Ky.; "Eve," exhibited at the St. Louis Exposition in 1904; "Apollo and Mercury," in Berlin; a statue of "Faith," in the cemetery at Rome; a "Homer" group, at the University of Virginia; "Virginia Mourning her Dead," at Lexington, Va.; and "Napoleon at St. Helena." His portraits, in the round and relief, include those of Liszt, Cardinal Hohenlohe, Longfellow, Lee, Farragut, and the statue of Mrs. Andrew D. White, at Cornell University. The work of Ezekiel is little known in this country, for the best of it remains abroad, but by his initial exhibit at the Centennial in 1876 he helped to destroy the prevailing classicism of American sculpture by introducing German and new Italian methods. His work departs from the conventional standard in many cases, is original in sentiment, and clever in workmanship. It shows the influence of Michelangelo rather than of the Greek models, although such works as "Consolation," "Pan and Cupid," and "Apollo and Mercury" are classical in tendency. He received many medals, the order of Pour le Mérite in art from the Emperor of Germany, and was knighted by the King of Italy.

EZION-GEBER, ē′zĭ-ŏn gē′bēr (Heb., where Geber trees grow). A station of the Israelites on their road from Egypt (Num. xxxiii. 35; Deut. ii. 8). It was originally a city of Edom, which David conquered (2 Sam. viii. 14). Later it was the station of Solomon's navy, which was engaged in the gold trade with Ophir (1 Kings ix. 26; 2 Chron. viii. 17); when Jehoshaphat fitted out ships for a similar purpose, they were broken at this port (1 Kings xxii. 48; 2 Chron. xx. 36–37). Josephus (*Ant.*, viii, 6, 4) says the place was called Berenice in his day. Ezion-Geber is probably identical with the modern Ain-el-Ghudyan, where is now the dry bed of the Arabah near Elath (q.v.). Consult Musil, *Arabia Petræa II: Edom* (Vienna, 1908).

EZ′RA (perhaps shortened from *Azariah*, Yahwe helps). A prominent figure in Jewish history, living in the Achæmenian period, leader of a band of exiles returning from Babylonia, legislative writer, and reformer. Little is known concerning his private life. He belonged to a priestly family and resided in Babylon in the reign of a king whose name is given as Artaxerxes. It is not certain whether Artaxerxes I (465–425 B.C.) or Artaxerxes II (404–359 B.C.) is meant. Most scholars think the former, but there is much to be said in favor of the latter. With Artaxerxes Ezra seems to have been in considerable favor, and he obtained permission to return to Jerusalem with a company of his countrymen, 1754 in number. Ezra was authorized to carry offerings to the temple made by the King and by the Jews who remained in Babylonia, to purchase sacrificial animals, and to use the rest of the money that was given to him as he saw fit. He is also represented as the "writer of the law of the God of heaven" (Ezra vii. 21) and is said to have been instructed and given power to carry out the laws of the Persian King and the law of God. The more commonly accepted date for his departure from Babylonia is 458 B.C., but it is not impossible that it was 398 B.C.

Ezra, on his arrival in Palestine, found the Jewish population, priests and Levites included, contracting marriages with foreign women. To one profoundly impressed with the fundamental principle that Yahwe's people must remain pure, such a state of affairs was intensely distressing. The question was taken up in an assembly of the people held in the year when Ezra arrived; and a commission of inquiry was appointed which drew up a list of persons who had entered upon mixed marriages. Nehemiah (q.v.), who had been governor in the time of Artaxerxes I, apparently from 445 to 433, had strongly objected to the mixed marriages, but without insisting upon their dissolution, had urged sabbath observance, rest for the land in the seventh year, and the payment of tithes, and had pledged the people to certain reforms (Neh. x). But Ezra went further. He forced the Jews who had married foreign women to divorce their wives, and he laid the foundation for a more accurate fulfillment of the will of Yahwe by presenting to the whole people on a solemn occasion the law of Moses. Most scholars are of the opinion that this event took place in the year 444 B.C. and is the one described in Neh. viii–x, where Ezra is pictured as gathering the people on the plateau before the Water Gate and reading to them the Book of the Law. It is possible, however, as some scholars think, that the assembly was held in 397; Nehemiah's name does not seem to have occurred originally in Neh. viii. 2, as it is not found in 3 Esdras ix. 49; and Neh. x appears to relate to a pledge given by the community, while Nehemiah was governor, before the time of Ezra. The impressive scene is described in detail. Two days are consumed in the reading. The men of Judah are profoundly impressed, and portrayed as moved to tears at the thought of their past disobedience. Preparations are at once made to carry out the law, and as a symbol of repentance a great fast is held. There is no reason to doubt that Ezra used some of his time in Jerusalem in preparing an elaborate code, and that this code was promulgated on the occasion described. How extensive the law book was, and whether all of it was read, cannot be determined. Some scholars think that practically all of our present Pentateuch was read; others maintain that only those sections to which the name of the Priestly Code has been given were read. There is reason to doubt, however, that any such code ever existed as a separate document; and it is not necessary to suppose that all the narratives, or even all the legal enactments, were publicly read. Exactly what part Ezra had in the production of the Pentateuch cannot be ascertained from the phrase designating him as "the writer of the law." That may mean anything, from mere copying to absolute authorship. According to a plausible theory it implies that Ezra wrote out a copy of the law more complete than any existing before his time, as various glosses, notes, and longer additions of different nature, which had grown up in the reading of the groundwork, were inserted in it. (See PENTATEUCH.) The new law book was formally recognized, and the temple service was regulated according to its prescriptions. Naturally not all the laws were carried out or could be, and it is doubtful whether at any time in the history of Israel all the pentateuchal regulations were adhered to in their detail; but what is important to note is that Ezra gave the strongest impetus to those tendencies which led to a conception of Judaism as identical with the observance of canonical minutiæ. Though the word "writer" does not have exactly the same connotation as the later "scribe," Ezra may be regarded as the forerunner of the rabbis who in the succeeding centuries took the place of the priests, and as students and interpreters of the law became, until recent times, so characteristic a feature of Judaism. Consult: Van Hoonacker, *Zorobabel et le second temple* (Ghent, 1892); Kosters, *Het herstel van Israel in het Perzische tijdvak* (Leiden, 1894); Bertholet, *Esra und Nehemia* (Tübingen, 1902); id., in *Die Religion in Geschichte und Gegenwart* (ib., 1910); Torrey, *Ezra Studies* (Chicago, 1910); Herford, *Pharisaism* (New York, 1912).

EZRA, BOOK OF. A record of portions of Jewish history after the Babylonian exile. It originally formed in the Jewish canon one book with Nehemiah, bearing the name of Ezra. This book is supposed to have been compiled by the author of Chronicles from various documents, such as: (*a*) the memoirs of Ezra and Nehemiah; (*b*) accounts of the building of the temple at Jerusalem in the reign of Darius; (*c*) copies of a correspondence in Aramaic with Artaxerxes I and Darius I and of Ezra's firman; (*d*) lists of heads of priestly and Levitical families; (*e*) lists of returned exiles—to all of which sources the editor has made additions of his own. In the Greek version the two books are still one and are called Esdras B, while Esdras A, or 3 Esdras, is essentially another, and possibly older translation. (See ESDRAS, BOOKS OF.) In the early printed Hebrew Bibles Ezra was still used as a heading for both, but the distinction is now made universally between Ezra and Nehemiah.

A division of the Book of Ezra into two parts suggests itself, the first of which (chaps. i–vi) contains: (1) the decree of Cyrus, dated in the first year of his reign and giving permission to the Jews to return to their own land and rebuild their temple; (2) the record of his restoration of the sacred vessels of silver and gold which Nebuchadnezzar had taken from the temple and brought to Babylon; (3) the return of a portion of the people and the commencement of the work; (4) the obstacles placed in their way, chiefly by the Samaritans, in consequence of the refusal of the Jews to allow them to share in the work; and (5) the interruption of the work till the second year of Darius Hystaspes, who, having found the decree of Cyrus, confirmed it and gave the Jews additional privileges and help by which they were enabled to complete their temple in the sixth year of Darius and to reëstablish divine worship. This part thus comprises the history of the Jews from 538 to 516 B.C. The second part (chaps. vii–x) contains: (1) the decree of Artaxerxes, giving Ezra authority to proceed to Jerusalem with all Jews who wished to accompany him, and an account of the large sums of silver and gold added by the King and his counselors to the free-will offerings of the people, and his order to his treasurers in the provinces intervening between Babylon and Jerusalem to furnish the expedition liberally with needed supplies; (2) the arrival of Ezra, accompanied by 600 chief men and 200 priests and Levites; and (3) the measures taken by Ezra for the suppression of mixed marriages. This part is supposed to refer to events taking place in 458 and 445 B.C., or if Artaxerxes II is meant, most likely in 397 B.C. (See EZRA.)

It is generally recognized that the historical value of the narratives in this book depends upon the character of the sources used by the author of Chronicles rather than upon anything that comes from his hand, and also that the work has suffered from various transpositions in the text, often indicated by the more correct arrangement in 3 Esdras. While it is not so universally admitted as in the case of the memoirs of Nehemiah, the majority of scholars believe that in Ezra vii. 27–ix. 15, and probably also in Ezra x, Neh. vii. 73 b–ix. 37, Memoirs of Ezra have been used, and that there is no reason to doubt the accuracy of his statements. The story of the return under Cyrus was questioned by Kosters and other scholars, but there is a disposition at present to assume that permission was given by Cyrus and that a small number availed themselves of it. Haggai, Zech. i–viii, and Neh. i. 2 ff. still render it difficult to think of large numbers returning in 538 and an attempt then to rebuild the temple. Since Eduard Meyer's defense of the Aramaic decrees in 1896 and the discovery of the Elephantine papyri (q.v.), which come from the fifth century and refer to Johanan the high priest and the sons of Sanballat of Samaria, the authenticity of the decrees of Cyrus, Darius, and Artaxerxes, as well as the Aramaic correspondence in general, has been more widely accepted than formerly. It should be noted, however, that Torrey has recently adduced important evidence that the language of the whole Aramaic section is of a considerably later type than that of the Elephantine documents, and numerous analogies showing that the production of letters and decrees was regarded as a legitimate method of historic composition. Van Hoonacker held on strong grounds that Nehemiah preceded Ezra, the former leaving Susa in 445, the second Babylon in the seventh year of Artaxerxes II (397 B.C.). Torrey and Schmidt gave various reasons for regarding Artaxerxes II as Nehemiah's King. In view of the Elephantine records this can be maintained to-day only if there were two Sanballats, which is not impossible, but cannot be proved. On the whole Van Hoonacker's opinion commends itself. Nehemiah's visits to Jerusalem would then be in 445 and 433, and Ezra's in 397. Bertholet has pointed out that Ezra at his arrival evidently found no governor in Jerusalem, while Nehemiah refers to a number of governors before him in such a manner as to make it clear that Ezra was not among them (Neh. v. 15), that Ezra presupposes the repairs and the rebuilding of the wall which was accomplished by Nehemiah (Ezra ix. 9), that Nehemiah's name did not originally occur in Neh. viii. 9, as the parallel passage in 3 Esdras shows, and that Neh. x has to do with the pledge taken by Nehemiah from the people that they would enforce certain reforms, and not with the introduction of the law by Ezra. As to the lists of the returned exiles, in the time of Cyrus (Ezra ii and Neh. vii), there is a tendency among scholars to regard them as in reality giving a census of the "children of the province" in the sense of citizens in the time of Nehemiah or Ezra. The attitude of scholars towards the Greek text designated by the early Church as Esdras A, but called 3 Esdras in the Vulgate, is undergoing a change. The older view of Grotius, Whiston, Ewald, and Lagarde has been reaffirmed by Howorth and Torrey, who have presented weighty reasons for believing that the earliest Greek version has been preserved in 3 Esdras. In this version Ezra iv. 5 is immediately followed by v. 1, and Neh. vii. 73 b–viii. 13 a immediately follows Ezra x. 44. It has long been felt that the correspondence with Artaxerxes (Ezra iv. 6–23) in the Masoretic text is out of place: and that the reading of the law (Neh. vii. 73–ix. 37) in reality belongs to the Book of Ezra. As 3 Esdras ends in the midst of Neh. viii. 13, it is a matter of conjecture how much of what follows this verse preceded Neh. i. 1. Bertholet plausibly argues that the list of those who entered into an agreement and the pledge they gave not to marry foreign women, to keep the sabbath, etc., in Neh. x, originally had its place after the reference to this pledge in Neh. xiii. According to Torrey the translator found in his Aramaic text the story of the three pages and Darius, which consequently was an early interpolation. That the Chronicler used his sources for this period with as much freedom as those he employed for earlier times (see CHRONICLES) is generally recognized, but there is still a difference of opinion as to the extent of his work. See also NEHEMIAH, BOOK OF. Consult: Schrader, in *Theologische Studien und Kritiken* (Vienna, 1867); Smend, *Die Listen der Bücher Esra und Nehemia* (Basel, 1881); Van Hoonacker, *Néhémie et Esdras* (Ghent, 1890); id., *Néhémie en l'an 20 d'Artaxerxes I et Esdras en l'an 7 d'Artaxerxes II* (ib., 1892); Kosters, *Het Herstel van Israël in het Perzische Tijdvak* (Leiden, 1894); Ed. Meyer, *Entstehung des Judentums* (Halle, 1896); Torrey, *The Composition and Historical Value of Ezra and Nehemiah* (Giessen, 1896); id., *Ezra Studies* (Chicago, 1910); Howorth, in *Proceedings of the Society of Biblical Archæology* (London, 1901–02); Schmidt, in *Biblical World* (Chicago, 1899); Ryle, *Ezra and Nehemiah* (New York, 1893); Siegfried, *Esra und Nehemia* (Göttingen, 1901); Bertholet, *Esra und Nehemia* (Tübingen, 1902); id., in *Die Religion in Geschichte und Gegenwart* (ib., 1910); Rothstein, *Juden und Samaritaner* (Leipzig, 1908); Batten, *Ezra and Nehemiah* (New York, 1913);

Cook, in Charles, *The Apocrypha and Pseudepigrapha of the Old Testament* (2 vols., Oxford, 1913).

EZZELINO, ĕt′se-lē′nô, or **ECCELINO**, DA ROMANO. An Italian Ghibelline family.—The first Ezzelino was a German cavalier who settled in Italy at the time of the Hohenstaufen dynasty and gained possession of the castle of Romano; hence the name.—Ezzelino II was, against all the family traditions, a Guelph. He lived about 1180.—His son, Ezzelino III, was podestà of Vicenza until a Guelph success (1194) caused his downfall. With the protection of the Emperor, Otto IV, he regained his position, but finally abdicated (1215).—Ezzelino IV (1194–1259), his son, the most celebrated of the family, became podestà of Vicenza upon the abdication of his father and directed all his energies against the enemies of his house. He established his capital at Padua, and by the victory of the Emperor Frederick II at Cortenuova (1237) became master of northern Italy from Milan to the Adriatic. After the death of Frederick II he acted as an independent prince. His cruelty and impiety, which gain him mention in Dante's *Inferno*, caused him to be excommunicated in 1252, and the Lombard cities made a league against him which he could not resist. He was taken prisoner in 1259 and died of voluntary starvation. His brother and all his family were murdered. Consult Stieve, *Ezzelino von Romano* (Leipzig, 1909).

F

F The sixth letter and fourth consonant in the Greco-Roman alphabet. The Phœnicians called the letter *vau* (or *wau*). This has usually been supposed to mean a nail or peg. As the Hebrew is the only Semitic tongue in which *vau* occurs as a word, it is probable that the name of this letter was not originally a word, but merely the sound of *u* or *w*. Some authorities hold that the top-stroke F is merely a modification of the consonant E, having no relation with the symbol *vau*. Flinders Petrie (*The Formation of the Alphabet*, London, 1912) states that the symbol F was a common sign in Asia Minor and has a long history in Egypt. According to this same authority it passed to Crete and Phylakopi, but was avoided by most of the Greeks, appearing solely at Corinth and Elis under the name *digamma*, which arose from a fancied resemblance to a pair of gammas (*F*). From Greece it passed into Italy, from which it was inherited by modern Europe. It should be noted that the value of the Greek symbol was the bilabial voiced sound of *w*, and not the labiodental voiceless sound of our modern F. Already in the second century of the Christian era the cursive capital *f* made its appearance, of which our small *f* is an outgrowth. There is, furthermore, a midstroke symbol, ɟ| or |ʅ, also found in ancient Egypt, which has been preserved notably in Etruscan, the Runic Inscriptions, and at Elis in Greece, but was finally driven out by the top-stroke form. See ALPHABET; LETTERS.

Phonetic Character. F is pronounced by joining the lower lip and the upper teeth, and it is a labiodental voiceless aspirate. Its corresponding voiced labiodental is *v*. Latin *f* was practically the same sound as English *f*, and was not like the Greek *φ*, which was distinctly a double sound (*p* + *h*), pronounced as in *top-heavy*. Under certain circumstances *f* may take the place of any of the mutes. Original *bh*, *gh*, and *dh* (in English *b*, *g*, *d*) may be represented by Latin *f*, as Skt. *bharati*, 'he bears,' Lat. *fert*, Eng. *bears;* Skt. *gharmas*, Lat. *formus*, Eng. *warm*. English *f* represents (1) an original *p:* Skt. *pitar*, Eng. *father;* Skt. *pāda*, Eng. *foot;* (2) a guttural: Lat. *quatuor*, Eng. *four;* Lat. *quinque*, Eng. *five*. The pronunciation of gutturals has a tendency to lapse into the easier sound; cf. *cough*, *laugh*, pronounced as if spelled with an *f*. Anglo-Saxon *f* sometimes disappears in modern English, e.g., *wīf-man*, and *hlāford*, now *woman* and *lord*.

As a Symbol. F, in music, is the fourth note of the natural diatonic scale of C and stands in the treble clef in the first space or in the fifth line; in the bass clef it stands on the fourth line or in the first space below. In chemistry F = fluorine. F as a mediæval Roman numeral stands for 40; with a bar above F it is 40,000. In algebra it serves as the sign of an operation in general, and particularly of a function having a differential coefficient. As an abbreviation, it stands for *Fellow* (in *F. R. S.*, etc.), in *fisheries* for *full fish*, in physics for *Fahrenheit*, and in a ship's log book for *fog*.

FA'BELL, PETER. A personage born and buried at Edmonton, Middlesex, England, mentioned as having died during the reign of Henry VII (1485–1509). He was said to have sold his soul to the devil, and after him is named the chief character in the once popular play *The Merry Devil of Edmonton*.

FABER, fä'bär, CECILIA BÖHL VON. See CABALLERO, FERNÁN.

FABER, fā'bĕr, FREDERICK WILLIAM (1814–63). An English theologian. He was born at Calverley, Yorkshire; studied at Harrow and at Balliol College, Oxford, where he became an enthusiastic admirer of John Henry Newman; and was ordained priest in 1839. After some years spent in traveling on the Continent, and having published a *Life of St. Wilfrid* (1844), he became a convert to the Roman Catholic church (1845) and founded the Wilfridians, or Brothers of the Will of God, at Birmingham. This community was ultimately merged in the Oratory of St. Philip Neri, of which Newman was the head, and over a branch of which, established in London in 1849, Faber presided till his death. Pope Pius IX in 1854 made him a D.D. He published lives of the saints and a number of theological works, but it is mainly as a writer of fervent and graceful hymns that he will be remembered. He wrote "O Gift of Gifts, O Grace of Faith," "Paradise, O Paradise," and other hymns in familiar use even in Protestant churches. Consult the *Life and Letters* (London, 1869; new ed., 1888) by Father Bowden.

FABER, fä'bĕr, FREDERIK (1795–1828). A Danish zoölogist. He was born at Odense on the island of Fünen, and graduated in law in 1818. From early youth he displayed a great interest in zoölogy and published his first book on that subject in 1815, under the title *Indledning til Dyrelæren til Brug ved den Naturhistoriske Undervisning*. From 1819 to 1821 he traveled through Iceland, and he published his investigations in a work of permanent value. entitled *Ueber das Leben der hochnordischen Vögel Islands* (1825–26). His other works include: *Prodromus isländischer Ornithologie* (1822), with the supplement, entitled *Nachtrag zur isländischen Ornithologie* (1824); *Naturgeschichte der Fische Islands* (1829); and numerous contributions to Oken's *Isis* and the periodical entitled *Tidsskrif for Naturvidenskaberne.* His name has been applied to several zoölogical species.

FA'BER, George Stanley (1773–1854). A learned divine of the Anglican church. He was the eldest son of the Rev. Thomas Faber and was born at Calverley, Yorkshire, Oct. 25, 1773. He entered University College, Oxford, in 1789. In 1796 he took his degree of M.A., was Bampton lecturer for 1801, and in 1805 became vicar of Stockton-on-Tees, Durham. After several changes he received from Bishop Van Mildert, in 1832, the mastership of Sherburn Hospital, near the city of Durham, where he died, Jan. 27, 1854. His management of the hospital estates was very judicious and successful. Faber wrote upward of 40 works, several of which enjoyed an extensive popularity, but have little permanent value. His theories of idolatry and his interpretations of prophecy are fanciful. The principal are: *The Genius and Object of the Patriarchal, the Levitical, and the Christian Dispensations* (1823); *The Difficulties of Infidelity* (1824); *The Difficulties of Romanism* (1826; 3d ed., 1853); *The Sacred Calendar of Prophecy* (1828); *The Primitive Doctrine of Election* (1830); *The Primitive Doctrine of Justification* (1837); *Eight Dissertations upon the Prophetical Promises of a Mighty Deliverer* (1845). Consult the memoir by F. A. Faber in G. S. Faber's posthumous *Many Mansions in the House of the Father* (1854).

FABER, fä'bâr′, or Fabri, Jacques Lefèvre d'Estaples, Lat. Jacobus Stapulensis (c.1450–c.1536). A French Roman Catholic, one of the first scholars and exegetes of his time. He was born at Estaples (Etaples), near Boulogne, about 1450. He studied at the University of Paris and became professor in the College of Cardinal Lemoine. He visited Italy, studying Aristotle with the Italian humanists. When his former pupil, William Briçonnet, became abbot of the Parisian Benedictine Abbey of Saint-Germain-des-Prés in 1507, he secured for Faber a home there, which he retained till 1520. Then he became director of the leper hospital at Meaux. His works were obnoxious to some of the church authorities, but he was safe from molestation under the King's authority till Francis I was taken prisoner at Pavia in 1525. Faber was then formally condemned, and his works were suppressed. He fled to Blois and to Guienne, or, according to some accounts, to Strassburg. On the return of Francis such proceedings were stopped, and he was made tutor of the King's children and royal librarian at Blois. When the Princess Margaret became Queen of Navarre, she received Faber in her city of Nérac, and there he passed his old age in quiet. He died there in 1536. Among Faber's works were the *Physics, Metaphysics,* and *Ethics* of Aristotle, and a psalter in five languages. In 1512 he issued a translation into French of the Epistles of St. Paul, in 1523 of the whole New Testament, in 1528 of the Pentateuch, and in 1530 of the entire Bible. These translations were from the Vulgate, with reference, however, to the originals, and corrections where Faber deemed them necessary. He also added short notes and comments, in which there were some indications of Protestant leanings. Faber's work has been the basis of all subsequent French versions. For his life, consult De Labatier Plantin (Montauban, 1870) and Prossdij (Leyden, 1900).

FABER, fä'bẽr, Johann Lothar von (1817–96). A German manufacturer. He was the proprietor of a small lead-pencil manufactory at Stein (Bavaria), which he enlarged to international proportions. He established offices in Berlin, Paris, London, and New York, and additional manufactories at Geroldsgrün (Upper Franconia, Bavaria), Noisy-le-Sec, near Paris, and New York (with cedar yard and mills at Cedar Keys, Fla.). To the manufacturing of lead pencils he added that of all sorts of writing, drawing, and painting materials. He received a patent of nobility and an appointment as counselor of state for his services to German industry.

FA'BER, or **FABRI,** fä'brê, Johannes (1478–1541). A Roman Catholic bishop, called the "Hammer of Heretics." His family name was Heigerlin, which he changed to Faber. He was born at Leutkirch, near Lake Constance, in 1478. He studied theology and canon law in Tübingen and Freiburg in Breisgau and became doctor in canon law. After parochial and cathedral service he was appointed in 1518 vicar-general of the diocese of Constance. He enjoyed the friendship of such men as Erasmus, Melanchthon, and Zwingli, and seemed likely to agree with them fully. But when the breach with the church became too wide, he chose the side of the latter, and in 1522 issued a work against Luther, and ever afterward was one of the most indefatigable, learned, and formidable opponents of the movement. His epithet comes from his work *Malleus in hæresim Lutheranan* (Cologne, 1524), but it is only one of many such writings. At the last disputation in Zurich (January, 1523) and the diets of Nuremberg (1523), Speier (1529), and Augsburg (1530), he bore a leading part and won general applause. In 1531 he became Bishop of Vienna, and in this exposed position the Turks gave him as much to do as the Reformers. He died at Baden, near Vienna, May 21, 1541. His collected works, so called, but really only the homiletical, appeared in Cologne (3 vols., 1537–41). The polemical works, *Opuscula Quædam J. Fabri Viennensis* (Leipzig, 1537), are more valuable. There is no complete biography of him. A. Horawitz, in his *Johannes Heigerlin genannt Faber, Bischof von Wien, bis zum Regensburger Convent* (Vienna, 1884), traced his life to 1524 only. Consult Janssen, *History of the German People,* vol. xiv (Eng. trans., London, 1909).

FABER, John, the elder (c.1660–1721). An English draftsman and mezzotint engraver. He was born at The Hague and settled in England probably in 1698. He was especially celebrated for the small pen portraits on vellum which he drew from life. One of the finest examples of this kind is the portrait of Simon Episcopius in the British Museum. In 1712 Faber was employed at Oxford and at Cambridge to engrave a set of 45 portraits representing the founders of the colleges. Other portraits engraved by him from life are those of Bishop Atterbury, Count Bothmer, John Caspar, Dr. Sacheverell, and Bishop Hough. Though somewhat stiff in execution, his mezzotints are much prized.

John Faber, the younger (c.1695–1756), a mezzotint engraver, studied under his father and at Vanderbank's Academy, London. His work consists chiefly of portraits, of which more than 400 have been preserved. These include plates of Ignatius Loyola (after Titian), Charles II (after Lely), Carreras (after Sir Godfrey Kneller), and the series of the "Beauties of Hampton Court" and "The Members of the Kit-Cat Club" (also after Kneller). Among the engravings of his which are not portraits are "St. Peter" (after Van Dyck) and "The Taking of Namur" (after Wyck). His works exhibit a high degree of excellence and, when arranged chronologically, a constant improvement in technique. They represent admirably the English manner of portraiture characteristic of the period immediately following Kneller.

FABER, Pierre (1506–46). See Lefèvre.

FA'BIAN. Bishop of Rome (236–250), reckoned as the twentieth Pope. He fell as one of the first martyrs in the Decian persecution after an efficient pontificate.

FABIAN GENS. See Fabius.

FABIAN SOCIETY, The. An organization for the advancement of Socialism. Thus far it has been the most important socialistic society in England. It started in London, but similar organizations are now found in many other cities. In 1883 an American, Thomas Davidson, who chanced to be in London, held parlor conferences with a group of literary workers chiefly, on the social duties of the times. This group continued to hold informal conferences. Socialistic theories gradually gained the upper hand in one section, and it finally became definitely socialistic. The name of the society, derived from that of the Roman general Fabius, who saved the state by his policy of delay, indicates the tactics of the party, the support of meliorative tendencies instead of revolutionary tendencies. In 1888 the society began holding public meetings. The addresses have since been published as the *Fabian Essays* (Amer. ed., Boston, 1894). The society carries on an active propaganda through the press, free lectures, etc. It seeks the nationalization of land and of such industries as can be "conveniently managed socially." Rent and interest must be added to the reward of labor. The idle class must disappear and practical equality of opportunity be gained. Consult: G. B. Shaw, *The Fabian Society* (London, 1892); Edouard Pfeiffer, *La Société fabienne et le mouvement socialist anglais contemporain* (Paris, 1911). See Socialism.

FABII, fā'bĭ-ī, Arch of the. An arch on the Sacra Via, at the entrance to the Roman Forum, erected by Quintus Fabius Maximus Allobrogicus, about 120 B.C., to commemorate his campaign against the Arverni and the Allobroges. The only remains are a few blocks of travertine discovered in 1882 near the site of the arch, which appears to have been small and of very simple architecture. Consult Platner, *The Topography and Monuments of Ancient Rome* (2d ed., New York, 1911).

FA'BIUS. The name of one of the oldest and most illustrious patrician clans of Rome. This family claimed descent from Hercules and a daughter of Evander. (See Lupercalia.) Three brothers of this clan—Quintus, Marcus, and Kæso Fabius Vibulanus—alternately held the office of consul for seven years (484–479 B.C.). In 479 the Fabii, under Kæso Fabius Vibulanus, migrated to the banks of the Cremera, a small stream that flows into the Tiber a few miles above Rome. Here, two years after, they were decoyed into an ambuscade by the Veientes, with whom they had been at war, and, with the exception of one member, Quintus Fabius Vibulanus, through whom the race was perpetuated, the entire gens, consisting of 306 men, was put to the sword. The most eminent of the Fabii were Quintus Fabius Rullianus—supposed to have been the first who obtained for himself and his family the surname of *Maximus*—and his descendant, Quintus Fabius Maximus Verrucosus, named Cunctator, 'the delayer.' The former was the most eminent of the Roman generals in the second Samnite War (c.326–304 B.C.) and was twice dictator and six times consul. At Sentinum, in 295 B.C., he defeated the Samnites and their allies. (See Rome, *History*.) The latter, who, in the course of his career, was five times consul and twice censor, was appointed dictator immediately after the defeat of the Romans by Hannibal at Lake Trasimenus, in 217 B.C. The peculiar line of tactics which he observed in the second Punic War obtained for him the surname by which he is best known in history. Hanging on the heights like a thundercloud, to which Hannibal himself compared him, and avoiding a direct engagement, he tantalized the enemy with his caution, harassed them by marches and countermarches, and cut off their stragglers and foragers, while at the same time his delay allowed Rome to assemble her forces in greater strength. This policy—which has become proverbial as "Fabian policy"—although the wisest in the circumstances, was appreciated neither in the camp nor at home; and shortly after, Marcus Minucius Rufus, master of the horse, was raised to an equal share in the dictatorship—a position, however, which he occupied for but a short time. At the end of six months, the legal period for holding the dictatorship, Fabius laid down the office. The consuls took command, and the defeat at Cannæ (q.v.) followed (216 B.C.). During his fifth consulship (c.210 B.C.) Fabius recovered Tarentum, which had long been one of Hannibal's important positions. He died in 203 B.C.—C. Fabius, surnamed Pictor, executed upon the walls of the temple of Salus (dedicated by the dictator C. Junius Brutus Bubulus in 302 B.C.) the earliest Roman paintings of which we have any record; and his grandson, Quintus Fabius Pictor, was the first writer of a Roman history in prose; he used Greek, Latin not yet being fit for prose writing. Fabius' work was much used by later authors, including Livy. The fragments of his *Annals* may be found in Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1883). Q. Fabius Maximus Allobrogicus defeated the Allobroges in 121 B.C. (See Fabii, Arch of the.) Consult Peter, *Veterum Historicorum Romanorum Reliquiæ*, vol. i (Leipzig, 1870). On the Fabii in general, consult Du Rieu, *Disputatio de Gente Fabia* (Leiden, 1856); Pauly-Wissowa, *Real-Encyclopädie der classischen Altertumswissenschaft*, vol. vi (Stuttgart, 1909).

FABIUS, The American. A name applied to Washington because, like Fabius Cunctator, he followed a policy of avoiding pitched battles, particularly in the campaigns of 1776 and the winter of 1778.

FABIUS, The French. Anne, Duc de Montmorency, Grand Constable of France (c.1492–

1567), so called from his policy of delay in Provence in 1536.

FA'BLE (ME. *fable*, from OF. *fable*, *fauble*, from Lat. *fabula*, narrative, from *fari*, to speak; connected with Lat. *fama*, fame, Gk. *φημί*, *phemi*, I say, Skt. *bhánati*, he says). A word of twofold signification. First, it is employed by some writers in a general sense to denote any fictitious narrative, as, e.g., the incidents in an epic or dramatic poem. At one time, also, when the myths of the Greeks and Romans were thought to be satisfactorily accounted for by regarding them as conscious inventions of the ancient poets and priests, it was customary to speak of them as *fables*, but this application of the term is now abandoned by scholars. (See MYTH.) According to the second and more frequent signification of the word, it denotes a special kind of literary composition, either prose or verse, in which a story of some kind is made the vehicle for conveying a universal truth. It differs from a parable in this respect, that, while the latter never transcends in conception the bounds of the probable or the possible, the former always and of necessity does. The peculiarity of the *structure* of the fable consists in the transference to inanimate objects, or, more frequently, to the lower animals, of the qualities of rational beings. By the very novelty and utter impossibility of the representation the interest of the hearer or reader is excited, and thus its symbolic meaning and moral become transparent to him, at least if the fable is well contrived. The ancient fabulists were simple, clear, and earnest in their representations. They seem to have sprung up in the East, and India was in all probability their home. From the rich collections of fables in the Sanskrit *Pancatantra* and *Hitopadeśa* (qq.v.) came, it would seem, the Æsopic beast stories. Other celebrated Oriental collections of fables, based directly upon the Sanskrit, are those of Bidpai (q.v.), or Pilpai, and of the Arabian Lokman. Among the Greeks the greatest name is that of Æsop (q.v.), whose fables at a much later period were versified by Babrius (q.v.). Among the Romans Phædrus cleverly imitated Æsop, but with considerable modifications, thus giving a certain amount of independent value to his work. It is perhaps worth mentioning here that the well-known fable of the *Town Mouse and Country Mouse*, told by Horace, is of purely Roman origin and is probably the only one in existence of which this can be affirmed.

Leaving the classical period, and before entering on the Dark Ages, we encounter the name of Aphthonius, who flourished in the early part of the fourth century, and who wrote indifferent fables in Greek prose; and still later, the name of Flavius Avianus, who composed 42, no better, in Latin elegiacs. During the Dark Ages the fable in various forms appears to have been cultivated in the monasteries, although nothing meritorious has survived; but later in the Middle Ages it acquired fresh life and vigor. In this form of literature the French have shown an undoubted superiority. From Marie de France, the most famous fabulist of the twelfth century, who claims to have translated her *Isopet* from the English, there has been a steady stream of fable literature unequaled in any other nation. The collection known as the *Roman de Renart*, which had the widest vogue all over Europe, makes its appearance in France between the twelfth and the fourteenth centuries. Many collections of apologues were published in the sixteenth century, the most important of which being those of Guillaume Guéroult, Barthélemy Aneau, Gilles Corrozet, and Guillaume Haudent, while the poet Clément Marot was in several instances the immediate source of the great La Fontaine (q.v.). In the eighteenth century fable literature was produced in abundance by Dorat, Piron, Colardeau, and others. The most prominent of all was Florian, who ranks next to La Fontaine, but whose indebtedness to the master was very great. The oldest-known German fabulist is Stricker, who lived about the middle of the thirteenth century; but the famous *Reineke Fuchs*, or the History of Reynard the Fox (q.v.), goes in some of its numerous primitive forms much farther back in Germany. In the eighteenth century the fables of Gellert, Hagedorn, and Lessing, in his earlier style, are modeled directly on those of La Fontaine. However, in his *Fabeln*, published in 1759, Lessing sought to base his apologues on common sense, considering Phædrus and La Fontaine as mere perversions of the ideal contained in Æsop. In England the best known of the early examples of the apologue is found in Chaucer's *Nonne Preste's Tale*, which is but an enlargement of Marie de France's *Don Coc et don Werpiel*. Lydgate's *The Churl and the Bird* is another good example of the English apologue, while Gay takes precedence as the leading English fabulist. In Spain, Italy, and Russia the most important names are those of Yriarte, whose fables are still enjoyed because of their sprightliness and charm, Pignotti, and Krylov. Many of Andersen's wonder stories are fables, in which the weaknesses of human nature are treated with an exquisite humor and sarcasm, not inferior to those of La Fontaine.

The stories of Brer Rabbit and the other animals by Joel Chandler Harris (q.v.) do not belong under the fable proper, as they are not the invention of the writer, but are valuable records of the folklore (q.v.) of the African-Americans. The same is true of similar stories gathered from the Indian tribes.

Consult: Lessing, *Ueber das Wesen der Fabel* (1760); Robert, *Fables inédites des douzième, treizième, et quatorzième siècles, et fables de La Fontaine rapprochées de celles de tous les auteurs* (Paris, 1825); Loiseleur Deslongchamps, *Essai sur les fables indiennes et sur leur introduction en Europe* (ib., 1838); Bechstein, *Mythe, Sage, Märe and Fabel im Leben und Bewusstsein des deutschen Volkes* (3 vols., Leipzig, 1854–55); Benfey, *Pantschatantra* (ib., 1859); Schlenker, *Collection of Temne Traditions, Fables, and Proverbs* (London, 1861); Bleek, *Reynard the Fox in South Africa* (ib., 1864); Hervieux, *Les fabulistes latins depuis le siècle d'Auguste jusqu'à la fin du moyen âge* (5 vols., Paris, 1884–99); Weddigen, *Das Wesen und die Theorie der Fabel* (Leipzig, 1893); Hirsch, *Die Fabel* (Cöthen, 1894); Bieber, *Studien zur Geschichte der Fabel in den ersten Jahrhunderten der Kaiserzeit* (Munich, 1906); Levrault, *La fabel, évolution du genre* (Paris, 1905); Revillout, "La fable en Egypte," in the *Revue des Questions historiques*, vol. lxxxii (ib., 1907); Plessow, *Geschichte der Fabeldichtung in England bis zu John Gay, 1726* (Berlin, 1906); Marchiano, *L'Origine della favola greca e i suoi rapporti con le favole orientali* (Trani, 1900); Archibald, *The Fable as a Stylistic Test in Classical Greek Literature* (Baltimore, 1912);

Macdonnell, *History of Sanskrit Literature* (London, 1913).

FABLE FOR CRITICS, A. A satirical poem by James Russell Lowell (1848), reviewing American writers and critics.

FABLIAUX, fä'blyō' (Fr., from OF. *fabliaus*, *fablel*, Prov. *fablel*, short story; connected with Lat. *fabella*, diminutive of *fabula*, story). Short stories in French octosyllabic verse, chiefly of the thirteenth century, frankly coarse, often brutal, usually comic and ironical, often cynically skeptical and bitter in their treatment of women, intensely satirical when describing the hypocrisy and vices of the weaker brethren of the clergy. They are realistic stories of everyday life, almost never touching upon the supernatural, and give a melancholy, possibly too dark, picture of national morals. They typify the *esprit gaulois* in their mocking disrespect for higher authority and their humorous treatment of salacious subjects. They appealed especially to the middle and lower classes, as a healthy reaction against the lackadaisical sentimentality of the *lais*, and have proved a storehouse to the novelists and dramatists of later times. Modern short-story writers are but the disciples of these early *jongleurs* (who both composed and recited the fabliaux) when they make everything subservient to the interest and climax of their story. From them Boccaccio, Chaucer, Shakespeare abroad, and in France the "nouvellistes en prose" of the fourteenth to the sixteenth century (e.g., La Salle, Marguerite de Navarre), later even Molière, drew some of their best material. The best collection of them is the *Recueil général et complet des fabliaux des XIIIème et XIVème siècles*, by Montaiglon and Raynaud (6 vols., Paris, 1872–90). Consult: Bédier, *Les fabliaux* (ib., 1893); W. M. Hart, "The Fabliau and Popular Literature" in *Publications of the Modern Language Association of America* (Baltimore, 1908); Gaston Paris, *La littérature française au moyen âge* (XIe–XIVe siècle) (Paris, 1909).

FABRE, fä'br', Ferdinand (1830–98). A realistic French novelist, distinguished for his psychologic analysis of priestly character. Unable to follow his vocation, the priesthood, he devoted himself at first to descriptions of clerical life, as in *Les Courbezon, scènes de la vie cléricale* (1862), whose minute analysis made him seem to Sainte-Beuve "a strong pupil of Balzac." Rustic sketches of his native southern France, as minute in their observation, followed. In this movement of "regionalism" tacitly asserting that Parisian life is not the only exclusively interesting aspect of French life, he easily proved himself to be a most powerful and inspiring factor. His most noteworthy novels are *Mon oncle Celestin: mœurs cléricales* (1881) and *L'Abbé Tigrane, candidat à la papauté* (1873), both clerical in subject and both translated into English. All his novels are directed, in one way or another, against ascetic pride and self-deception. They show a robust, healthy sympathy with life, a rather heavy playfulness, and a divination of the celibate clerical mind that is unique in this generation. Consult E. W. Gosse, *French Profiles* (London, 1905), and G. Pellissier, *Etudes de littérature contemporaine* (Paris, 1898).

FABRE, François Xavier Pascal (1766–1837). A French painter, born at Montpellier. He was a pupil of David and won the Prix de Rome in 1787. Afterward he lived in Florence, where he painted principally portraits and became professor at the Academy. It is supposed that he privately married the Duchess of Albany, the widow of the "Young Pretender," who at her death made him her sole heir. The collection of works of art she left him he added to considerably and bequeathed to the city of Montpellier to form the nucleus of the Musée Fabre. He also established a school of design at Montpellier in connection with the museum, and was himself its first director. Most of his works are at Montpellier. They include "Death of Abel," "Saul's Remorse," and a portrait of Canova. His "Neoptolemus and Ulysses" is in the Louvre. The paintings of Fabre are in the classical style and, though highly finished, are relatively good in color.

FABRE, Hector (1834–1910). A Canadian journalist. He was born in Montreal and was educated at L'Assomption and St. Hyacinthe Colleges, and at St. Sulpice College in his native city. He studied law and was called to the bar in 1856; but he relinquished the legal profession and entered journalism, becoming editor of *L'Ordre* (Montreal). In 1863–66 he edited the well-known *Le Canadien* (Quebec) and in 1869 founded *L'Evénement* in that city. In 1873 he was an unsuccessful Liberal candidate for the House of Commons, but in 1875 he was appointed a member of the Dominion Senate. In 1882 he became resident agent in Paris for the Quebec and Dominion governments and resigned his seat in the Senate. In Paris he founded the French-Canadian journal, *Paris-Canada*. He was elected a fellow of the Royal Society of Canada and in 1886 was appointed a companion of the Order of St. Michael and St. George. His writings, especially the *Chroniques*, were remarkable for vivacity and wit. He published: *Esquisse biographie sur Chevalier de Lorimier* (1856); *Ecrivains Canadiens* (1865); *Confédération, Independence, Annexation* (1871); *Chroniques* (1877).

FABRE, Jean Henri (1823–1915). A distinguished French entomologist, born at Saint-Léons, Aveyron. For some years he was a teacher in the Lycée of Avignon and professor of physics at the College of Ajaccio. He became a corresponding member of the Institute and a chevalier of the Legion of Honor. In retirement at Sérignan he produced his greatest work, *Souvenirs entomologiques* (10 vols., 1879–1907), which was crowned by the Institute. His works also include: *La science élémentaire* (1862–65); *Histoire de la bûche* (1866); *Notions préliminaires de physique* (1867–70); *Le livre d'histoire* (1868); *Les ravageurs* (1870); *Astronomie élémentaire* (1872); *Les auxiliaires* (1873); *Lectures scientifiques: zoölogie* (1873); *Botanique* (1874); *Premiers éléments de physique* (1874); *De chimie* (1875), *De sciences naturelles* (1875); *Les serviteurs* (1875); *La plante* (1875); *L'Industrie* (1875); *Cours complet d'enseignement littéraire et scientifique* (1876); *Livre des champs* (1879); *Les inventeurs et leurs inventions* (1880); *Le vie des insects* (1910). Parts of his writings have been published in English as *Insect Life*, trans. by the author of *Mlle. Mori* (1901): *The Life and Love of the Insect*, trans. by A. T. de Mattos (1911); *Social Life in the Insect World*, trans. by Bernard Miall (1913); *The Life of the Spider*, trans. by A. T. de Mattos (1913); *The Life of the Fly*, trans. by A. T. de Mattos (1913); etc.

FABRE, Marie Joseph Victorin (1785–

1831). A French poet, born at Jaujac (Ardiche). The brilliant success achieved in his youth with his *Eloge de Boileau* (1805), crowned by the Academy, did not continue beyond a few years. He died practically forgotten. His works were collected (1844–45) by one of his pupils, J. Sabbatier. They include the best poems, *Discours en vers sur les voyages* (1807); *Eloge sur Pierre Corneille* (1808); *La mort de Henri IV* (1808); *Opuscules en vers et en prose* (1806); *Eloge de La Bruyère* (1810).

FABRE D'EGLANTINE, fȧ'br' dȧ'glänɴ'tėn', Philippe François Nazaire (1750–94). A French dramatist, born at Carcassonne. He was an actor in his youth and did not establish himself in Paris until 1787. During the next seven years he produced 27 plays, the best known of which are *Le Philinte de Molière*, or *La suite du Misanthrope* (1790); *Le convalescent de qualité ou l'aristocrate* (1791), and *Les précepteurs*, a posthumous comedy (1799). He was an ardent Revolutionist, a friend of Danton and Desmoulins, and president of the Cordeliers. Sent as a deputy to the Convention, he voted for the death of the King. He was accused of corruption by his enemies and of moderation by Robespierre, and with Danton and Desmoulins was condemned and executed. The accusation was afterward disproved. His *Œuvres mêlées et postumes* (2 vols.) were published in 1892 and his *Correspondance amoureuse* (3 vols.) in 1796 and a second edition in 1899.

FABRETTI, fȧ-brĕt'tė, Abiodante (1816–94). An Italian antiquary. He was born at Perugia, and became professor of archæology in the University of Turin in 1860 and director of the museum of Antiquities there in 1868. He was the author of *Corpus Inscriptionum Italicarum Antiquioris Ævi* (1867), and many works on the history and antiquities of Perugia. He was made a senator of Italy in 1889.

FABRETTI, Raffaele (1618–1700). A distinguished Italian antiquary and archæologist, born at Urbino, in Umbria. While a student of law at Rome he was attracted to the study of the ancient ruins and from that time devoted himself as far as possible to classical and antiquarian research. Under Pope Alexander VII he became treasurer and subsequently auditor to the Papal Embassy at Madrid. After 13 years at Madrid he returned to Rome, taking advantage of his journey through Spain and France to become acquainted with the Roman remains in those countries. At Rome he was made judge. Later, after a short residence at the Papal Legation in Urbino, he returned once more to Rome and devoted himself to his favorite pursuits until he was appointed by Innocent XII keeper of the papal archives of the castle of St. Angelo—a post of great responsibility, which he held till his death. His more important works are: "De Aquis et Aquæ Ductibus Veteris Romæ," in Grævius, *Thesaurus*, vol. iv (1680); *De Columna Traiani Syntagma* (1683; 2d ed., 1790), containing also a discussion of the so-called *Tabula Iliaca* (q.v.); and *Inscriptionum Antiquarum Explicatio* (1699). His collection of inscriptions and monuments is deposited in the Ducal Palace of Urbino.

FABRI, fä'brė, Felix (German name, *Schmid*) (?–1502). A German monk and author. He was lector in the Dominican monastery in Ulm, and made two voyages to the Holy Land—the first to Jerusalem (1480), and the second (1483), upon which he had entered as chaplain to Johann von Waldburg, to Jerusalem and Mt. Sinai and thence by way of Cairo and Alexandria to Venice, where he arrived Jan. 8, 1484. After his return to Ulm he published an account of this tour, which is probably the most important work of the kind that appeared during the latter part of the Middle Ages. The German version was published in Feyrabend's *Reyssbuch des heiligen Lands* (Frankfort, 1584), the Latin version in vols. ii, iii, and iv of the *Bibliothek des litterarischen Vereins* (Stuttgart, 1843–49).

FABRI, Friedrich (1824–91). A German Protestant theologian and promoter of colonization. He was born at Schweinfurt and was educated at Erlangen and Berlin. After holding several pastorates he was appointed director of the Missionary Society at Barmen in 1857. He retained this post until 1884, when he retired to Godesberg-on-the-Rhine, where he developed a beneficent activity as president of the Evangelical Society for the German Protestants in America. He was appointed to an honorary professorship at Bonn in 1889 and attracted attention by his numerous writings on religious subjects and on Germany's colonial policy, of which the most important are *Bedarf Deutschland der Kolonien?* (3d ed., 1884) and *Fünf Jahre deutscher Kolonialpolitik* (1889). His other literary works include: *Briefe gegen den Materialismus* (1856); *Die Entstehung des Heidentums und die Aufgabe der Heidenmission* (1859); *Die politische Lage und die Zukunft der evangelischen Kirche in Deutschland* (3d ed., 1874); *Staat und Kirche* (3d ed., 1872).

FABRI, Jacques L. d'Estaples. See Faber.

FABRI, Johannes. See Faber.

FABRIANO, fä'brė-ä'nô. An episcopal city of Ancona, central Italy, 1066 feet above sea level, at the foot of the Apennines, 44 miles southwest of Ancona (Map: Italy, D 3). In the city hall and in several churches and private houses are paintings by the local school, of which Allegretto Nuzi (1308–85) was the head, followed by his pupil, Gentile da Fabriano (1370–1451). The paper and gunpowder manufactories of the city have been famous since the fourteenth century; it also manufactures parchment leather, and has trade in grain and cattle. Pop. (commune), 1901, 21,096; 1911, 23,752.

FABRIANO, Gentile da. See Gentile da Fabriano.

FABRICE, fä-brēs', Georg Friedrich Alfred, Count (1818–91). A German soldier and statesman, born at Quesnoy-sur-Deule, France. In 1834 he entered the Saxon cavalry and by 1865 had become chief of the general staff with rank of major general. When Saxony joined Austria against Prussia in 1866, he was appointed chief of staff to the Crown Prince Albert, commander of the forces of Saxony in Bohemia. After the war, in October, 1866, he became Minister of War of Saxony. He acted as the representative of Saxony in the negotiation of the military convention with Prussia and reorganized the army of Saxony after the Prussian type. He took a prominent part in the Franco-German War, and in 1871, after the preliminaries at Versailles, which he largely conducted, he was in command of the German army of occupation in France and later in the same year was a second time appointed Minister of War of Saxony. He became Prime Minister of the Kingdom in 1876 and Minister for Foreign Affairs in 1882 and was made Baron in 1878 and Count in

1884. Consult Dittrich, *General von Fabrice* (Dresden, 1884).

FABRICIAN (fȧ-brish'an) **BRIDGE.** A stone bridge at Rome, joining the island of Æsculapius with the left bank of the Tiber, built by Lucius Fabricius in 62 B.C., to replace a wooden bridge dating from about 192 B.C. It is the only ancient Roman bridge that has endured. Of its four arches, one is hidden by the modern embankment. It is now the Ponte dei Quattro Capi. Consult Platner, *The Topography and Monuments of Ancient Rome* (2d ed., New York, 1911).

FABRICIUS, fȧ-brē'tsē-ụs, DAVID (1564–1617). A German theologian and astronomer, born at Esens, East Friesland. In 1584 he became pastor at Resterhaave and in 1603 at Osteel, where on May 7, 1617, he was murdered by a peasant whom he had accused from the pulpit of theft. The variable star Mira, in the constellation Ceti, was discovered by him (Aug. 3, 1596); and his astronomical and meteorological observations were of service to Kepler in the investigation of the planet Mars. In 1895 a monument was erected to his memory in the churchyard of Osteel.

FABRICIUS, fȧ-brĭsh'ŭs, GAIUS FABRICIUS LUSCINUS. A Roman general and statesman of the fourth and third centuries B.C., who became for later ages a model of incorruptibility. He was consul in 282 B.C. and again in 278. In 282 he defeated the Bruttians and the Lucanians. He commanded in the war against Pyrrhus (q.v.). Tradition declared that, when, after the defeat of the Romans at Heraclea in 286, he was sent to treat for the ransoming of the prisoners, Pyrrhus sought to bribe him in order to gain a favorable peace, but that Fabricius scorned the bribe and made such an impression on the King that the Roman prisoners were immediately released. On another occasion the physician of Pyrrhus offered to Fabricius to poison his master; but, said the story, the upright Roman sent information of the treachery to the King, whereupon Pyrrhus again released all his Roman prisoners, in order not to fall behind in this contest of generosity. In 278 Fabricius concluded a peace with Pyrrhus, who left Italy. In 276 Fabricius was censor, together with Quintus Æmilius Papus, and as such carried out with great vigor the old Roman sumptuary laws. For victories over the Bruttians, the Lucanians, and the Samnites he was honored with a triumph. He died poor, and it is said that his daughter was aided by a grant from state funds.

FABRICIUS, fȧ-brē'tsē-ụs, GEORG (1516–71). A German scholar and Neo-Latin poet, born in Chemnitz, Saxony. He became rector of the College of Meissen in 1546, and in 1570 was appointed poet laureate by Maximilian II. He owes his reputation to his Latin poetry, published in *Poematum Sacrorum Libri XV* (1560). He also prepared an edition of the scholia to *Horace* (1555); he edited Terence (1548) and Vergil (1551). He wrote three elaborate works on Roman archæology, *Antiquitatum Libri II* (1549), *Itinerum Liber Unus* (1551), and *Roma* (1551). In his *Roma* he described the remains of ancient Rome and collected the references to them in Roman literature. He wrote also on the history of Saxony. Consult Baumgarten-Crusius, *De Georgii Fabricii Vita et Scriptis* (Meissen, 1839).

FABRICIUS, or **FABRIZIO,** fȧ-brē'tsē-ō, GIROLAMO (1537–1619). An Italian anatomist and surgeon, commonly named, from his birthplace, Fabricius ab Aquapendente. He was the son of humble parents, who sent him to the University of Padua, where, in addition to the usual instruction in the classics, he studied anatomy and surgery under Fallopius. On the death of the latter, in 1562, Fabricius was appointed to fill the vacant professorship. He continued to hold this office for nearly half a century, during which period his high reputation for eloquence, general and professional knowledge, attracted students from all parts of the civilized world to Padua. Among these students was Harvey (q.v.), who derived from Fabricius' observations on the valves of the veins the first clew to his great discovery of the circulation of the blood. Fabricius was a most laborious student of comparative anatomy, from the standpoint of which he treated the eye, the larynx, the ear, the intestinal canal, the development of the fœtus, and many other subjects. The improvements which his knowledge of anatomy enabled him to introduce into the practice of surgery were very great; and his *Opera Chirurgica* (1617), which embraced every complaint curable by manual operation, passed through 17 editions. The Venetian Republic erected for him a spacious anatomical amphitheatre, gave him an annual stipend of 1000 crowns, and created him a knight of the Order of St. Mark.

FABRICIUS, *Ger. pron.* fȧ-brē'tsē-ōōs, JOHANN ALBERT (1668–1736). A German classical scholar, born at Leipzig. He was professor of rhetoric and ethics at Hamburg from 1699 to his death. He stands preëminent among scholars for his two literary synopses, *Bibliotheca Latina* (3 vols., 1697, revised and improved by Ernesti, Leipzig, 1773), and *Bibliotheca Græca* (14 vols., 1705–28, revised by Harles, Hamburg, 1790), his greatest work. These two works give respectively the history of Latin and Greek literature; the *Bibliotheca Græca* is founded on a first-hand knowledge of every edition quoted and is the basis of every subsequent history of Greek literature. He published also: *Bibliotheca Latina Mediæ et Infimæ Ætatis* (5 vols., 1734), *Bibliotheca Antiquaria*, which gave the modern literature of classical antiquities (1731–36), and reëdited Banduri's *Bibliotheca Nummaria*, which gave the literature of numismatics (q.v.). He is known among theologians for his collections of the apocryphal and pseudepigraphical literature (1703 and 1713). Consult the biography by his son-in-law, H. S. Reimar, *De Vita et Scriptis J. A. Fabricii Commentarius* (Hamburg, 1737); Micéron, *Mémoires des hommes*, vol. xi (Paris, 1739); Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

FABRICIUS, JOHANN (1587–1615). A German astronomer. He was born in East Friesland, studied medicine at Wittenberg, and was afterward educated in astronomy by his father, David Fabricius. He appears also to have spent some time in Holland and to have obtained there for his father one of the earliest specimens of the astronomical telescope. In his famous work, *Narratio de Maculis in Sole Observatis et Apparente Earum cum Sole Conversione*, published at Wittenberg in 1611, he announces his discovery of the solar spots and of the rotation of the sun on its axis. In his letters to Marcus Velserius (Markus Welser), not published until 1613, Galileo claims to have discovered the solar spots in November, 1610. It is probable, therefore, that the honor of priority remains with Fabricius.

FABRICIUS, Johann (1644–1729). A German theologian, born at Altorf, near Nuremberg, and educated at Nuremberg, Helmstedt, and Altorf. In 1677 he became professor of theology at Altorf, and in 1697 at Helmstedt. In 1701 he was appointed abbot of Königslutter, and in 1703 counselor of the Consistory of the Dukedom of Brunswick. On comparative symbolism he wrote *Consideratio Variarum Controversiarum cum Atheis, Gentilibus Judæis, Mohammedanis, Socianis, Anabaptistis, Pontificiis, Reformatis* (1704; abridged ed., 1715), which so incensed the strict Lutherans that he was bitterly attacked on all sides. His *Gutachten* (1704), in which he recommended the Princess Elizabeth Christine of Brunswick to embrace Catholicism in order to be married to Charles of Spain (afterward the Emperor Charles VI), caused great scandal and brought about the dismissal of Fabricius from the university in 1709. His *Historia Bibliothecæ Fabricianæ* (1717–24) and *Amœnitates Theologicæ* (1699) give much autobiographical information.

FABRICIUS, Johann Christian (1743–1808). A German entomologist, born at Tondern in Schleswig. He studied at Copenhagen, Leyden, Edinburgh, Freiberg in Saxony, and Upsala, where he was a pupil of Linnæus. In 1775 he became professor of natural history at the University of Kiel. He developed a system for the classification of insects, based upon the structure of the mouth parts, which had an important influence upon the development of the science. His principal works are: *Systema Entomologica* (1775); *Philosophia Entomologica* (1778); *Supplementum Entomologiæ* (1797).

FABRICIUS HILDANUS, properly Wilhelm Fabry (1560–1634). A German surgeon. He was born at Hilden, near Düsseldorf, and was educated at Cologne. After practicing at Lausanne and at Payerne (Canton of Waadt) he became physician of the city of Bern, where his great renown as a teacher and operator attracted students from all parts of Europe. Besides his work *Observationum et Curationum Chirurgicarum Centuriæ* (Lyons, 1641), he wrote: *De Gangræna et Sphacelo* (1593); *Lithotomia Vesicæ* (1626); and the treatise entitled *Kurze Beschreibung der Fürtrefflichkeit, Nutz und Notwendigkeit der Anatomey* (1624).

FABRIZI, fȧ-brĕt′sê, Nicola (1804–85). An Italian soldier and patriot, born at Modena. For taking part in the Modena insurrection of 1831 he was thrown into prison. Upon gaining his freedom he went to Marseilles, where he helped Mazzini organize the Savoy expedition. Later he fought in Spain on the Liberal side against the Carlists, and after this war he established himself at Malta. With Crispi he organized a revolution in 1848 and another uprising in 1860 in Sicily. In the latter year he united his forces with those of Garibaldi at Palermo, and under the latter's dictatorship he was Governor of Messina and Minister of War. In 1861 he aided Cialdini in the extirpation of brigandage and in 1866 he was Garibaldi's chief of staff. Later he became a member of the Italian national Parliament.

FABRONI, fȧ-brō′nê, Angelo (1732–1803). An Italian biographical writer, born at Marradi, in Tuscany. He was educated at Faenza and Rome, and in 1773 was appointed tutor to the sons of Leopold, Grand Duke of Tuscany. His most important works are: *Vitæ Italorum Doctrina Excellentium qui Sæculo XVII et XVIII floruerunt* (20 vols., 1778–1805); the *Laurentii Medicei Vita* (1748); the *Vita Magni Cosmi Medicei* (1788–89).

FABRONI, or **FABBRONI,** Giovanni Valentino Matteo (1752–1822). An Italian chemist, naturalist, and engineer, born in Florence. As the friend and collaborator of Fontana he became director of the physical cabinet of the Grand Duke of Tuscany. He was appointed by Napoleon director of the roads and bridges leading beyond the Alps. The construction of the pass across Mount Genèvre, and the Corniche, the celebrated road leading from Nice to Geneva, was carried out by him. He worked in almost every field of science, so that Cuvier dubbed him a "living encyclopædia." He wrote many useful treatises on botany, chemistry, and rural economy, such as *Antichità, vantaggi e metodo della pittura encausta* (1797); *Degli antichi abitatori d' Italia* (1803); *Ricerche sulla Quina* (1803); *Dei provvedimenti annonarj* (1808).

FABRY, fä′brê, Wilhelm. See Fabricius, Hildanus.

FAB′ULOUS ANIMALS. See Bestiaries; Griffin; Unicorn; Fable; Heraldry; Basilisk.

FABVIER, fä′vyȧ′, Charles Nicolas, Baron (1782–1855). A French general and philhellene. He was born at Pont-à-Mousson and in 1807 was sent by Napoleon to Constantinople to fortify that city against an attack by the English fleet. He later organized a park of artillery at Ispahan, Persia, for defense against Russia. He was the adjutant of General Marmont in Spain in 1811, and in 1813 was advanced to the rank of colonel on the general staff. In consequence of his political activity against the restored monarchy he went to England, and in 1823 to Greece to participate in the War of Greek Independence. He was appointed commander in chief of infantry, but failed to retain the confidence of the Greeks, because of the unfortunate expedition to the island of Chios and the loss of the Acropolis; and in 1829 he returned to Paris, where he became chief of staff to the National Guard. In 1848 he was Ambassador to Constantinople. His publications include *Journal des opérations du VI corps pendant la campagne de 1814 en France* (1819). Consult Debidour, *Le général Fabvier, sa vie et ses écrits* (Paris, 1892), and the same author's "Fabvier à l'Acropole" and "Les dernières années du Général Fabvier," in *Séances et travaux de l'Académie des sciences morales et politiques*, vols. 159, 161 (Paris, 1903, 1904).

FA′BYAN, or **FABIAN,** Robert (?–1513). An English chronicler, who was a member of the Drapers' Company and an alderman of London. His *New Chronicles of England and France*, first published in 1516, begin with the arrival of Brutus and extend to the battle of Bosworth (1485). His efforts to harmonize the accounts of previous writers were rendered almost valueless by his lack of judgment and his inability to sift evidence, but he is a valuable authority for the affairs of London during his own time. The chronicle was continued by others in successive editions until 1558, and in 1811 an edition was issued by Sir Henry Ellis. In Stow's *Survey of London* there seems to have been used material gathered by Fabyan but not found in his *Chronicles*.

FAÇADE, fȧ-säd′ *or* fȧ-sȧd′ (Fr., front of a building). The exterior front or face of a building. The rear of an important building is sometimes called the rear façade, and an edifice may have as many façades as it has architectural faces with individual treatment. Thus a Gothic cruciform church commonly has three façades—viz., the west or main front, and the ends of each transept; in a Greek temple the two short gable ends are façades, while the two long sides are merely flanks. An elevation of the side of a building is called the *lateral* façade. The sides of a court or cortile are often called façades, but this is an incorrect application of the term. A façade which does not conform to the section of the building behind it, but rises above or extends beyond it, is called a *screen* façade, as in the case of many Italian churches (Pisa Cathedral, the Certosa at Pavia, etc.), of some English cathedrals, as Peterborough and Lincoln, and of many Romanesque churches of France. Such a method was apparently unknown in ancient and early Christian architecture.

FACATATIVÁ, fä′kȧ-tä′tē-vä′. A town in the Department of Cundinamarca, Colombia, about 20 miles northwest of Bogotá. It lies about 8500 feet above sea level, and was a fortress of the Chibcha Indians, whose last chief, Triquesupa, was killed here by a soldier under Quesada in 1538. The town derives some commercial importance from its proximity to the capital. Pop., about 8000.

FACCIOLATI, fä′chō-lä′tē, JACOPO (1682–1769). An Italian classical scholar and lexicographer. He was born at Torreglia, not far from Padua, and was educated at Padua, where he became professor of logic and later rector of the Institution. He was famous throughout Europe as a teacher. He directed his attention chiefly to the revival of the study of ancient literature, and with this object brought out a new edition of the *Lexicon Septem Linguarum*, called, from its original author, the monk Ambrosius of Calepio, the *Calepine Lexicon* (see CALEPINO). He was assisted in this work by his pupil, Egidio Forcellini (1715–19). To Facciolati has often been credited the conception of a great work, *Totius Latinitatis Lexicon;* it has commonly been said that Forcellini aided him in this work. But C. E. Bennett in "The Authorship of the Forcellini Lexicon," in *The Classical Weekly*, v, 34–37 (New York, 1911), has clearly shown that Forcellini not only conceived and planned this work, but executed it in full himself; for forty years (1718–58) he labored on the *Lexicon*, which was finally published in four volumes (Padua, 1771). The *Lexicon* in its time was of immense value; original documents printed in the last revision, by De Vit (Prato, 1858–87), prove clearly Forcellini's authorship. It has been said that, were Latin literature to perish, it could be restored from Forcellini's *Lexicon*. Facciolati published *Fasti Gymnasii Patavini*, a history of the University of Padua (1757). Facciolati and Forcellini, assisted by several others, likewise published a new edition of Nizoli's *Thesaurus Ciceronianus*. See FORCELLINI.

FACETIÆ, fȧ-sē′shĭ-ē (Lat., witticisms). A collection of witty sayings and short tales in prose or in verse. A Greek collection of this kind called *Asteia* (ed. by Eberhard, Berlin, 1869) was attributed to Hierocles (q.v.). Facetiæ were common in the late mediæval Latin writers, but the first book devoted wholly to them seems to have been the *Liber Facetiarum* of Poggio Bracciolini (Rome, 1470). For the jest in modern literature, see JEST.

FÂCHEUX, fȧ′shẽ′, LES (Fr., The Bores). A comedy by Molière (1661).

FA′CIAL ANGLE. See ANTHROPOMETRY.

FACIAL NERVES. The seventh cranial nerve in Sömmering's classification is the motor nerve of the face. It originates in the floor of the fourth ventricle of the medulla oblongata. Leaving the interior of the skull by a diverse course through the temporal bone, entering the petrous portion of the latter through the internal auditory meatus, it reaches the tympanum, crosses its internal wall, takes a downward course through the Fallopian canal, and finds its exit through the stylomastoid foramen. It supplies the buccinator and all the muscles of expression of the face, the muscles of the external ear, the platysma, stylohyoid, and part of the digastric muscle in the neck. According to an earlier classification the seventh and eighth nerves were considered as one, because in part of their course they occupy a common sheath. From their consistency the facial was called the *portio dura*, and the eighth, or auditory, the *portio mollis*. The sensory nerve of the face is the trigeminus, or trifacial nerve, known as the fifth in Sömmering's list. It has three branches: (1) the ophthalmic, which passes to the eyeball, the brow, the forehead, and the nose; (2) the superior maxillary, which supplies the side of the nose, the lower eyelid, and upper lip; (3) the inferior maxillary, which supplies principally the teeth and gums of the lower jaw and the lower lip. For the deep origin and exact description of these nerves, consult Gray, *Anatomy* (Philadelphia, 1913).

FACIAL NEURALGIA. A paroxysmal pain in the head and face, in the parts to which the trifacial or trigeminal nerve runs. (See FACIAL NERVES.) There are two varieties: 1. *Symptomatic facial neuralgia*, with pains sharp and intense, often lasting for many days without ceasing, or disappearing and returning frequently. It is caused by anæmia, exposure, bad teeth, gout, rheumatism, diabetes, syphilis, malaria, hysteria, epilepsy, injury, or septic poison. Application of heat or of menthol may relieve, or quinine, arsenic, or aconitia (a dangerous drug), with treatment of the cause. 2. *Tic douloureux*, a very intense form, in which the pains last a few moments each time, recurring on moving the tongue or chewing, exposure to a draft, etc., and dependent upon a neuritis or degenerative process in the nerve. Salicylates, injections of alcohol, or electrical diffusion of cocaine or iodides may relieve. Removal of a part of the nerve or of a ganglion connected with the nerve may be required. The ganglion itself has been injected by means of a long hollow needle—an exceedingly delicate operation, not unattended with danger.

FACIAL PARALYSIS. Paralysis of the facial nerve on which depends the power to move the muscles of the face. One or both sides of the face may be thus affected. The paralysis may be central, due to disease of the brain, or peripheral, due to disease of the nucleus from which the nerve springs, or of the nerve itself. The latter is the frequent type and is called "Bell's palsy." In this form there is paralysis of one side of the face, which comes on rapidly, the face being drawn to the unaffected side, while the eye of the affected side remains open, the tears overflow, the tongue deviates to the affected side, and saliva drips from the angle of the mouth. The patient cannot whistle. Food collects between the cheek and the gums on the affected side. Taste is lost in many cases on the anterior part of the tongue on the affected side. Electrical contraction of the affected muscles is abnormal and in time reveals degeneration of the nerve tissue. Facial palsy is caused by gout, exposure, syphilis, or middle ear disease, etc. The treatment usually consists in the administration of iron and strychnine, and the application of galvanism over the "motor points" of the individual muscles thus affected. A hook of protected wire worn over the ear and holding up the angle of the mouth may be of use in some cases. The cause must also be treated. Recovery is the rule, except in cases where the nerve has been divided by operation or disease. Anastomoses of the peripheral end of the cut nerve with the spinal accessory or the hypoglossal nerves is sometimes undertaken, with a fair degree of success. See PARALYSIS.

FACINGS, MILITARY. The colored trimmings of military uniforms, which denote the branch of the service to which the wearer belongs. The facings on the edge of a coat are called *piping,* those on the skirt of the coat, *back slashes.* Formerly the term *facings* applied only to the colored cuffs and collars. In the United States the facings of infantry are white and blue; of cavalry, yellow; and of artillery, scarlet. The uniform regulations of 1902 substituted for the colored cuffs and collars dark blue piped with the appropriate color, except in the Quartermaster Corps, which retained the buff collar and cuff. The other facings are as follows: Engineers, scarlet piped with white; Hospital Corps, maroon piped with white; Ordnance, black piped with scarlet; Service Schools, green; Signal Corps, orange piped with white.

Up to the end of the last century in the British army the royal regiments used blue facings; the nonroyal white for English, yellow for Scottish, and green for Irish regiments. This custom has been changed and at the present time regiments are authorized to use the distinctive regimental colors and facings belonging to the individual regiment previous to 1881.

In modern armies bright-colored facings are used only on the *dress uniform,* worn in garrison and on ceremonial occasions. The *field uniform,* for protective reasons, is of a neutral, nondescript color: olive drab in the United States army, khaki in the British army. Similar neutral colors are used for the field uniform of other Powers.

FACINO CANE, fȧ-chē'nō kä'nȧ. A tale by Balzac, setting forth the story of the author's struggles (1836).

FACSIMILE, făk-sĭm'ĭ-lē (abbreviation of Lat. *factum simile,* made like). An exact copy, especially of handwriting, of printed works, engravings, inscriptions, manuscripts, and the like.

FAC'TOR (Lat., a maker, from *facere,* to make). In arithmetic any one of the integral numbers whose product is a given number is called a factor of that number; e.g., in $72 = 4 \cdot 9 \cdot 2$, 4, 9, 2 are the factors of 72. A number factor is a factor which is a prime number. Thus the prime factors of 72 are 2, 2, 2, 3, 3. In algebra the factors of a rational integral algebraic expression are the rational integral expressions which, multiplied together, produce it; e.g., in $x^6 - y^6$, the factors are $(x - y)$, $(x + y)$, $(x^2 + xy + y^2)$, $(x^2 - xy + y^2)$. These factors can be factored further, but not into rational factors. Thus the expression is said to be fully factored in the domain of rationality. The highest common factor in algebra is the factor of highest degree common to the given expressions, and although it corresponds to the greatest common divisor in arithmetic, it must not be confounded with it. If numbers are substituted for letters, the value of the highest common factor is not always the greatest common divisor of the values of the given expressions; e.g., the highest common factor of $x^2 - 3x + 2$ and $x^2 - x - 2$ is $x - 2$. Let $x = 31$; then the values of the expressions are 870, 928, whose greatest common divisor is 58; but $x - 2$ is only 29. See also DIVISION.

FACTOR. An agent employed to sell the goods of another; in the United States such an agent is usually called a commission merchant, because he has his compensation in a commission or percentage upon the goods he sells. He differs from a broker in that he has actual possession of the goods of his principal and is empowered to deliver them to the purchaser as if they were his own. He often buys and sells in his own name, so that those dealing with him may not know whether he is owner or factor. Under some limitations for self-protection he is bound by the instructions of his principal and responsible for damages arising from a violation thereof. As a rule he must obey special instructions, and if none are given, he is bound to use all reasonable care in the management of the property committed to his charge, to employ the usual methods of business, and to have due regard to the interests and welfare of his employer. Otherwise he is not entitled to his commissions, and for injurious neglect of duty may even be sued by his principal. He cannot delegate his authority without express permission of his principal unless such delegation is justified by general usage or by stress of peculiar circumstances. He cannot sell goods at a sacrifice for the purpose of obtaining his commission and advances. It is generally held that a factor who has made advances upon goods acquires such an interest in them that the principal cannot take them out of his possession by a revocation of his authority. The factor can sell enough of them to reimburse himself if the principal unreasonably neglects or refuses to pay him. Sometimes, in consideration of an increased commission, he guarantees to the principal payment for the goods which have been sold. In that case he acts under a *del credere,* or guaranty, commission, and is in general subject to most of the obligations of a surety. It was formerly held that a factor whose principal resides in a foreign country is personally liable to the other party, even though the foreign principal was disclosed. The modern view is, however, that a factor who names his principal is not personally liable on contracts made for his principal, whether foreign or domestic, provided they are within the factor's authority and do not profess to bind him personally. See AGENT. Consult: Mechem, *Treatise on the Law of Agency* (Chicago, 1889); Evans, *Treatise on the Law of Principal and Agent* (New York, 1891); Bowstead, *Digest of the Law of Agency* (5th ed., Toronto, 1912).

FACTOR ACTS. The legal designation of a series of modern statutes in England and America, conferring upon agents who are intrusted with the possession of goods the authority to vest a good title thereto in an innocent purchaser. At common law a factor (q.v.) had no implied authority to pledge or barter his principal's goods. Even when they were shipped to him, and their possession as well as the bill of lading or other document of title intrusted to him, he had not the legal power to pledge or barter them. The common-law doctrine, that a person cannot give a better title than he possesses, enabled the principal to recover his property from a pledgee, although the latter had advanced money to the factor in the honest belief that he was the true owner. The inconveniences resulting from this principle, with the opportunities for fraud which it permitted, led the mercantile and banking community to demand that a person into whose possession goods or documents of title were put by the true owner be treated as having unqualified power to dispose of them. Partial effect was given to this view in England by the Factors Act of 1825 (Geo. IV, c. 94), and in a few of our States by legislation fashioned after that statute. Under these acts, factors or agents of a similar character, who are intrusted with the possession of goods or the documents of title thereto for the purpose of sale, are to be deemed the true owners, so far as to give validity to any sale or pledge made by them to an innocent purchaser or pledgee for value. In England the new doctrine has been carried even further than this. The courts there, as here, having construed the earlier acts very strictly, the mercantile community has insisted upon their repeated revision; each new statute going further than its predecessor towards the substitution for the common-law rule, stated above, of the doctrine which prevails upon the continent of Europe, that any one in the possession of goods, with the consent of the owner, whether a factor or not, shall be able to give a perfect title thereto to an innocent purchaser for value from him. This legislation, taken with that upon conditional sales, has practically abrogated, so far as personal property is concerned, the former doctrine of the common law that the purchaser of property buys it at his peril and gets only such title as his vendor has to give. See Caveat Emptor. Consult: Chambers, *Sale of Goods Act* (London, 1899); Pearson-Gee, *Commentary on the Sale of Goods Act* (ib., 1893); Burdick, *The Law of Sales of Personal Property* (3d ed., Boston, 1901); Benjamin, *Treatise on the Law of the Sale of Personal Property* (5th ed., London, 1906).

FACTOR OF SAFETY. The excess of strength or capacity to resist stress due to forces applied to the structure, expressed as a multiplier of the greatest anticipated normal stress. That is, if a structure is six times as strong as it need be to withstand the greatest expected or computed stress, the factor of safety is six. It allows for some defects in the material, some uncertainties in the assembly of structural elements, some exceptional increase in loads or stresses above the normal or usual, some excessive stresses in the processes of assembly, some ignorance, and differences of opinion as to magnitudes of stresses and the resisting strength of the materials. It is always more than two, but rarely larger than ten. See Strength of Materials.

FACTORIES AND THE FACTORY SYSTEM. A factory may be defined as an establishment where a number of persons coöperate by consecutive processes in the production of some article of consumption. Carroll D. Wright, in his report on the factory system for the Tenth United States Census, uses the following definition, which he borrows from Taylor's *Factories and the Factory System*, published in London in 1844: "A factory is an establishment where several workmen are collected for the purpose of obtaining greater and cheaper conveniences for labor than they could procure individually at their own homes; for producing results by their combined efforts which they could not accomplish separately; and for preventing the loss occasioned by carrying articles from place to place during the several processes necessary to complete their manufacture."

Historical Development. As is the case with most other great industrial movements, it would be difficult to assign to the origin of the factory system an exact place or date. The system originated in England in textile manufacture, during the latter half of the eighteenth century, but its germ already existed in the carding and fulling mills which had been common for many years previous. During the eighteenth century, however, a remarkable series of inventions was made, by which automatic machinery was introduced as a substitute for, or at least a supplement to, hand labor in the manufacture of cotton and woolen cloth. The history of these inventions, among the most important of which are those of Arkwright, Hargraves, Cartwright, and Crompton, is given elsewhere in the biographical sketches of their inventors and in the general articles on Spinning and Weaving. The importance of these inventions, not only industrially, but economically, can scarcely be overestimated, for by them not only was the cost of clothing wonderfully cheapened and physical comfort thereby increased, but a new system of industrial activity was developed which was destined to supplant the old system of master and apprentice, not only in the textile manufactures but in nearly all branches of labor, from the making of a watch to the slaughter of live stock. This change was a necessary accompaniment to the use of the new inventions, for machinery of itself is too expensive and its use involves too large an outlay for raw material and for disposing of the finished product to make it available to the independent artisan.

The introduction of automatic textile machinery was accompanied by the opposition, and by the persecution of its promoters, which have characterized most of the great movements for the world's betterment. At first, too, the new system met with failure from another source, the lack of sufficient capital and of a sufficiently large group of laborers to render profitable or even possible the installation of the more expensive power-driven machinery. Only water power was available to drive the machinery; hence the operator must locate his factory, not at some important industrial centre, but at a spot where sufficient supply of water power was available, and this might be an isolated place where labor was scarce. It is interesting to note that some of England's earliest factory legislation, as the Robert Peel Act of 1802, was directed towards correcting the abuses in the employment of pauper and more especially child labor by these early operators, who could not procure in the neighborhood of their factories sufficient adult labor to run their machines. If, then, the first step in the introduction of the factory system was the invention of automatic machinery—in distinction from tools—the second step was the application of steam as a motive force to drive this machinery. The use of steam at once freed the operator from geographical restrictions and made it possible for him to locate his factory where both labor and the demand for its fruits were most abundant.

But with the slow, cumbrous, and expensive methods of transportation that were in vogue until the close of the eighteenth century the factory system could not have attained its present proportions. The output must have been regulated largely by the local demand. Hence the third step in the development of the modern factory system was made possible by the introduction of the steamship and the railway, by means of which the products of any locality could be sent quickly and cheaply to all parts of the world. But previous to the appearance of steam navigation, from 1767 on, the canal system was widely extended throughout England, and, by enabling the cheap distribution of coal and iron, proved of great importance to manufacturing in large factories.

A fourth factor in the development of the factory system was the evolution of the patent system. Automatic machinery presupposes the work of men of inventive genius, upon whose labors it is absolutely dependent. When the fate of such men was almost certain persecution and poverty, an inventor must be a hero as well as a genius, and under such conditions inventions were few and far between. As Byrne points out in his *Progress of Invention in the Nineteenth Century*, until the close of the eighteenth century superstition had so strong a hold upon the human mind that inventions were almost synonymous with the black arts. A labor-saving machine was looked upon as the enemy of the working man, and many an earnest inventor, after years of arduous thought and painstaking labor, saw his cherished model broken up and his hopes forever blasted by the animosity of his fellowmen. But during the nineteenth century the patent system, which had long been in existence, was so fostered and developed by government that it became possible for a man not only to benefit his fellows, but to earn a comfortable and honorable livelihood by the exercise of his inventive faculties. Under this stimulating influence appeared a series of important inventions which resulted in the extension of automatic machinery, and hence of the factory system, which was at first limited to textiles, to all branches of industry. Chief among the multitude of important inventions which stimulated the development of the factory system were the planing machine (1802), the circular wood saw (introduced into the United States in 1814), galvanized iron (1837), vulcanizing of rubber (1839), Howe's sewing machine (1846), watch making by machinery (1850), Bessemer process of making steel (1855), paper from wood pulp (1864), McKay shoe-sewing machine (1861), the Siemens-Martin open-hearth steel process (1866), and the roller mill and middlings purifier for making flour (1875).

Although the four steps essential to the growth of the factory system—the introduction of automatic machinery, the application of steam as a motive force, improved methods of transportation, and an enlightened encouragement of the patent system—had all been taken at the beginning of the nineteenth century, the growth of factories was slow, even in England and the United States, where it was least opposed. At first England, in which the great textile machines were brought out, jealously guarded her treasures and passed severe laws prohibiting the exportation of machinery or models thereof. In spite of several attempts on the part of Americans to introduce English methods, the secrets were tolerably well kept until 1790. In that year a factory was built by Samuel Slater at Pawtucket, R. I., in which Arkwright's system of water-frame spinning was introduced. From that time the factory system, as applied to textiles, promoted by Whitney's invention of the cotton gin in 1792 and by Lowell's introduction of the power loom and other improvements in his factory at Waltham, has enjoyed uninterrupted progress and has powerfully influenced the development of the factory system in other lines. Carroll D. Wright says that the Lowell factory at Waltham, Mass., completed in the fall of 1814, "was the first in the world, as far as the records show, in which all the processes of converting raw cotton into the finished product were performed in one establishment, by successive steps under one harmonious system."

Owing to different economic conditions—due to the difference between an old country, where population centres are fixed, and a new, where immigration and the rapid growth of the country make any favorable site a possible centre of population—the development of the factory system in the United States was not only later, but also different in character from that in the mother country. Water power continued to be the almost exclusive motive power long after the application of steam was understood. It was the splendid water power offered by the Merrimac River that determined the location of Manchester, Lowell, and Lawrence, and so powerfully affected the industrial growth of New England. It may be added that the inventions and achievements of the hydraulic engineer have been scarcely less essential to the development of America's factory system than those of the inventor of automatic machinery. Many of the experiments in hydraulic engineering which have been most fruitful were conducted in efforts to improve current methods of developing and applying water power as a motive force for driving machinery. Within recent years the possibilities of utilizing water, especially at a long distance, have been enormously increased by transmitting power in the form of an electric current.

Outside of the cotton and woolen mills the growth of the factory system in the United States was slow. Domestic and neighborhood industry continued to predominate, even in these industries, until 1830, and it was not until 1840 that the factory method extended itself widely to miscellaneous industries. It was in 1840 that Bigelow applied power-driven machinery to the weaving of carpets, and 10 years later, at Waltham, Mass., automatic machinery was used for the first time, by consecutive processes, in a single manufactory, in the making of the most delicate of mechanical instruments, the watch. (See WATCH.) Gradually, with the invention of the requisite machinery, the new method of production was extended to other industries. During the last half of the century, and particularly after the close of the Civil War, factories of all kinds sprang up, first in New England and later in the West and South. The new system obtained little footing in the South until the very close of the century, when, tempted by the low cost of "mountain white" and colored labor, much capital, largely from New England, was directed towards the establishment of factories in the South. By the close of the century the system prevailed throughout America and the greater part of Europe as the usual means of production, to the almost entire extinction of domestic and small-shop industries. Germany, in particular, experienced a great industrial awakening towards the close of the century, and has so far outstripped England in the extent and variety of her factory products that the phrase "made in Germany" is the bugbear of the English manufacturer. The nineteenth century also saw the establishment of the factory system in India, Japan, and China. In China the attempt has scarcely passed the experimental stage; for, though wages are low, labor is so unskilled and unreliable that, measured by the product, it is most expensive.

The great advances made in all departments of applied science during the century have already proved far-reaching in their effects upon the factory system. The use of electricity for long-distance transmission of power has already been mentioned. For distributing and applying power as well, electricity is proving an economical and convenient substitute for steam, and seems likely to do away with much of the cumbersome and uncleanly shafting and belting by means of which power is distributed through the ordinary factory. Edward Atkinson goes so far as to prophesy that the use of electric power, so easily transmitted and applied, will finally result in the dispersion to their own homes of the multitudes of workers now gathered in factories, and that the weaver will work at his own loom and the spinner at his spindle in his own cottage, and a new form of power-driven household industry will supplant the factory system. Few will agree with Mr. Atkinson in thus forecasting the probable effect of electricity upon the factory system. The whole trend of modern industry is towards a still greater centralization of capital and labor. "The larger the plant the cheaper the product," says a prominent mill operator. Andrew Carnegie, writing on the development of the steel industry in the United States, puts the case still more forcibly when he says: "One essential for cheap production is magnitude; concerns making 1000 tons of steel per day have little chance against those making 10,000 tons. We see this law in all departments of industry. It evolves the 20,000-ton steamship and the 50-ton railway car. Improved engines and the use of electricity as a motor, the new loading and unloading machinery are all contributory causes to the cheapening of steel. . . . Among those contributory causes," adds Mr. Carnegie, "automatic machinery ranks first and continuous processes next. Workshops 1100 and 1200 feet long are becoming common, in which the raw material (ore) enters at one end and emerges finished (steel billets) at the other without handling, and often without stopping except for reheating."

In one branch of industry, however, two other systems of production have flourished side by side with the factory system, although apparently antagonistic to it. These are the sweat shop and tenement-house work in connection with the ready-made clothing industry. (See SWEATING SYSTEM.) In all branches of the clothing industry—not only in the making of textile garments, but of hats, gloves, and shoes—home and small-shop labor have been strangely persistent. Certainly the abuses which have sprung up in connection with the manufacture of clothing outside of factories have been so grave and far-reaching as to make the evils of the factory system seem but trifling in comparison. In fact, the obvious and universally proposed remedy for the sweat shop and for unsanitary tenement-house labor is the application of the full-fledged factory system to the manufacture of all parts and all kinds of garments.

Having traced the fundamental causes which have produced the factory system, one is led to ask, What are the effects of this system industrially, economically, and sociologically upon modern life? The introduction of the factory, with its great economy of labor, has often created crises of unemployment. Its competition has destroyed hand industries, rendering obsolete much painfully acquired skill and reducing prosperous mechanics to indigence. Its ultimate effect, however, has rather been to increase the demand for labor than to reduce it. A more accurate timekeeper can now be produced in a watch factory for a few dollars and in a few hours than the skill of the Swiss watchmaker, whose family has been trained for generations to the work, can produce in as many weeks. But this cheapening and bettering of the product has so enormously increased the demand that a proportionately larger body of men are engaged in different branches of the business—from the inventing and making of the delicate machinery required to the selling of the finished product—than ever before. Although this may not be true in all branches of manufacture, yet the introduction of the factory system, by cheapening production, has so raised the standard of living and enlarged the number of industries that labor was never so much in demand nor so well paid as at present.

But while most authorities admit the great industrial advantage of the factory system, the nature of its economic and sociological tendencies, and especially of its intellectual and moral effects upon the factory employee, are disputed. Low wages, unsanitary working conditions, exploitation of the labor of women and children antedate the factory system, just as they are found to-day in parts of Europe untouched by its influence. It would appear, however, that under no other system can the worker be so mercilessly driven, so completely sapped of his natural energies, as under the factory system. On the other hand, the conditions of labor are much more easily regulated by law than in the small workshop. Further, the aggregation of workers under one roof leads naturally to organizations and to collective resistance to conditions that are intolerable. The factory system, with its natural consequences, trade unionism and labor legislation, may properly be regarded as a potent means for elevating the worker from the hopeless poverty in which he was sunk in early modern times. But it is to be borne in mind that the development of labor organization and of the legal regulation of labor is slow, and that hence the first effect of the introduction of the factory system is to increase the hardships to which the laboring class is subject. Even in a country with a long-established factory industry, like England, there are evidences of widespread physical, mental, and moral degeneracy of the working population, traceable to child labor, insecurity of employment and overstrain. Students of labor conditions in America have frequently called attention to the injuries suffered by female workers through the strain of tending speeding machinery and to the early superannuation of male factory workers, essentially a result of overwork. While there has been a progressive shortening of the working day (see Eight-Hour Day), few would maintain that this has been sufficient to counteract the effects of increasing speed. Much hope is at present reposed in the developing systems of scientific management (q.v.), which has for one of its cardinal principles the relief of labor from excessive strain.

It is also contended that the factory system, in which each operator repeats indefinitely a single task, requires and creates a lower grade of intelligence among workingmen than the old system under which the laborer knew the whole of his trade; that the man who works in the modern shoe factory, feeding an automatic sole-cutting machine or automatic heeler, does not need and will not have the mental vision of the ancient shoemaker. It is unquestionably true that many operations that formerly required the services of a highly skilled mechanic have been subdivided in the factories into minute parts, each of which is performed by an operative in mechanical routine measurable in speed alone. It must not, however, be forgotten that the factory makes employment for a large body of foremen, overseers, mechanical experts, etc., elevated from the ranks of common labor and enjoying a lot far superior to that of the master workman of an earlier period. Even the common laborers of the factory, when not crushed with overwork, find in the opportunities for social life and organized activity rendered possible by a shorter working day, some offset for the loss of interest entailed by the automatic character of their employment.

It cannot be denied that the factory system, by the specialization of industries in given localities, thus making each community dependent upon all the rest of the world for everything except the one or few articles locally produced, has enormously quickened commerce and increased the interdependence of nations and is thus one of the greatest unifying forces of the age. See Labor; Labor Legislation; Manufactures.

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FACTORY ACTS. See Labor Legislation.

FACTORY INSPECTION. The most important part of factory legislation, for it is only by the constant visits of well-trained, intelligent, and efficient inspectors that factories can be prevented from evading and practically nullifying the laws. Such inspectors can strengthen the laws by liberal interpretations of their powers, by advocating better legislation, and by publishing full reports in which the facts are presented in such a way as to impress the general public with the need of reform. Unfortunately few factory inspectors are as yet trained workers. As a rule, their numbers are insufficient to maintain adequate supervision of all factories; many are political appointees; some are conscientious but unintelligent. It is, however, due to the labor of certain inspectors that many improvements have been made in the laws. The first factory act was passed in England in 1802, which was to be enforced by the local justices, who should appoint visitors. In 1833–34 four government inspectors were appointed, to whom nine inspectors were added in 1842, and subinspectors, together with greater powers, in 1844–46. A law of 1867 experimented with the inspection of workshops by means of local authorities, but the centralized system was found superior. The consolidated Act of 1878 increased the staff of inspectors, and since 1893 working men and women have been appointed on the force, and the numbers again increased. The department is under the Home Office, the chief inspector in London, fire superintending inspectors in London, Manchester, Glasgow, and Leeds, and 48 assistants. The inspectors render admirable reports, the working men frequently go to them for advice, and the trade-unions demand that their number should be increased. In the United States factory inspection is provided for by law in a majority of States, yet as late as 1913 there were 14 States, with more than half a million industrial wage earners, with no provision for factory inspection whatever. Of the remaining States very few have thoroughly efficient systems. The most frequent defects are: (1) inadequate number of inspectors, Texas, e.g., having in 1913 only one inspector; (2) failure to enforce standards of efficiency in the selection of inspectors; (3) lack of centralized control of inspection. The inspection of factories is in most States under the department of labor; in some States it is an independent department. In Massachusetts factory inspection is conducted by the police department. In Wisconsin so much of factory inspection as pertains to safety and sanitation is under the control of the Industrial Commission. In 1886 the International Association of Factory Inspectors, with members from Canada and the United States, was organized to promote uniformity in factory laws. See Labor Legislation; Labor Problem; Sweating System.

FAC'ULÆ (plur. of Lat. *facula*, small torch). In astronomy, the spots, brighter than the rest of the surface, which are sometimes seen on the sun's disk. They are usually very small at first, but finally assume very large dimensions. See Sun.

FACULTATIVE PLANT. A plant able to grow in more than one life condition; applied especially to plants that may be either parasites or saprophytes, as opposed to obligate plants. See Symbiosis; Parasite; Plant.

FACULTY (Lat. *facultas*, ability, from *facilis*, easy, from *facere*, to do). A term used generally in psychology to denote any sort of mental function. Specifically the name "faculty psychology" is applied to a psychological school which has its typical representative in Christian Wolff and its most renowned expositor in Immanuel Kant (q.v.). Its mode of procedure is to take the functional terms in common use (feeling, perception, understanding, memory, imagination, etc.), and by logical process to reduce them to some one, two, or three principal faculties, to which the others are then subsumed as subordinate faculties. The mind thus appears as constituted of certain powers or potentialities, which are realized in the individual cases of remembering, thinking, etc. Wolff himself recognizes two principal faculties—knowledge and desire—though he endeavors to unify them in a single supreme faculty of representation. The lower faculty of knowledge includes sense, imagination, the poetic faculty, and memory; the higher includes attention, reflection, and understanding. The lower faculty of desire, again, comprises pleasantness and unpleasantness, sense desires and aversions, and emotion; the higher includes volition, positive and negative, and freedom. Kant adopts a threefold classification of mental phenomena, though he subordinates all the mental powers to the faculty of knowledge ("understanding," in the wider sense). This comprises (1) understanding in the narrower sense, which is legislative for knowing; (2) reason, which is legislative for the faculty of desire; and (3) judgment, which legislates for feeling. Knowledge is further divided into a lower or receptive faculty of sense, and a higher or active faculty of understanding.

It is clear that a psychology based on these principles of classification can never pass the bounds of superficial description. It makes no effort to analyze mental processes; and the powers or functions which it discriminates have no biological or genetic sanction. Moreover, there is always the danger that a classificatory term, such as "memory," shall be raised to the rank of an explanatory principle, substantialized or hypostatized; in which case superficiality is changed to serious error. It does no harm to group together all the facts of remembering and forgetting, under a general class term "memory"; such grouping may, indeed, be useful, as serving to bring all the relevant facts before the psychologist's attention. But if we go further and proceed to account for a given fact of remembering by appeal to the mind's power of memory we have involved ourselves in a vicious circle. It is one of Herbart's great merits that, (1) by insisting on the need of starting psychological investigation from the given facts and not from possibilities which the facts are supposed to realize, and (2) by emphasizing the abstract and purely classificatory nature of the faculty concepts, he removed a powerful and growing abuse and paved the way for the more vigorous and scientific methods of modern psychology. The service is all the greater, since "popular" psychology is, in the nature of things, a faculty psychology, and the doctrines of the latter are therefore peculiarly insidious. Consult: Herbart, *Werke*, ed. by Von Kehrbach (Leipzig, 1882); Wundt, *Physiologische Psychologie* (ib., 1908–11); Titchener, *Experimental Psychology*, I, ii (New York, 1901).

FACULTY, of a University. See University.

FACULTY OF ADVOCATES. See Advocates, Faculty of.

FADETTE, fȧ'dĕt', La Petite (Fr., the little Fadette). An idyllic romance by George Sand (1848).

FADEYEV, fȧ-dā'yĕf, Rastislav Andreévitch (1824–84). A Russian soldier and military author. He was born at Ekaterinoslav and educated at the artillery school in St. Petersburg. At the age of 16 he entered the army that served in the Caucasus. He subsequently participated in the war in Asiatic Turkey, was present at the siege of Sebastopol, and in 1864 was promoted to the rank of major general. In consequence of a Panslavistic publication, entitled *The Military Power of Russia* (1868; Ger. trans. by Eckardt, 1870), which caused considerable stir at the time, and in which he demanded the annihilation of Austria and expressed sentiments strongly antagonistic to Germany and favorable to France, he was compelled to resign his commission in 1866. He was subsequently sent on missions to Egypt (1875) and Servia and Montenegro (1877), where he participated in the siege of Antivari. In 1881 General Ignatev gave him an appointment in the administrative department of the press at St. Petersburg. His publications in the Russian language, which are widely known, comprise besides the works already mentioned: *Sixty Years of War in the Caucasus* (1860); *Opinion on the Eastern Question* (Eng. trans. by T. Mitchell, 1871; also trans. into German); *Letters on the Present State of Russia* (1881). His collected works were published at St. Petersburg in 1890 (4 vols., including a biography and a review of his literary activity).

FÆCES, fē'sēz (Lat. *fæx*, dregs). Excrements, the waste material evacuated from the bowels, consisting of undigested food, indigestible parts of food, bile, mucus, and certain other matters taken from the blood by the liver and other glands. In birds, reptiles, and fishes, in the Monotremata order of mammals, and in many lower animals, urine is also mixed with the fæces before they leave the body. The fæces of the horse, cow, and hen are commonly spoken of as manure and used as a fertilizer. The excrement of wild birds, collected in great quantities on islands where they propagate, is called guano (q.v.). Human excrement, after being prepared by a patented process, is called poudrette, which is also used as a fertilizer. The composition of human fæces is shown in the following table:

	Per cent.
Water	73.3
Organic remains	7.0
Biliary and nitrogenous matter	14.9
Albumen	0.9
Extractives	2.7
Salts	1.2

The examination of the fæces has become an important diagnostic measure. Macroscopically, abnormal quantities of mucus, deficiency of bile, excess of fat, gallstones, casein curds, soaps, and intestinal worms may be discovered. *Intestinal sand*, consisting chiefly of particles of phosphate or carbonate of calcium, magnesium, or iron, occurs in the stools of certain neurotic individuals. *Azotorrhœa* is an excess of muscle fibres and indicates pancreatic disease.

Microscopical examination reveals the presence of minute parasites, the amœba (in amœbic dysentery and liver abscess), bacteria, starch granules, blood corpuscles, etc. Bacteria are very numerous; their weight equals about one-third of the weight of the dried stool.

FAED, fād, John (1819–1902). A Scottish miniature, genre, and historical painter. He was born at Barlay Mill, in the Stewardry of Kirkcudbright, where his father was an engineer and millwright. His talent was precocious, and at 12 he traveled through the villages of Galloway, painting miniatures of the gentry and middle classes. In 1839 he attended the art classes at Edinburgh, and practiced successfully for more than 40 years as a miniature painter; but gradually he turned to biblical and literary subjects. He was elected to the Royal Scottish Academy in 1851. In 1862–80 he resided at London, retiring finally to Gatehouse, near his birthplace, where his last years were spent. His work is essentially literary in character, detailed and elaborate in finish, but lacking in pictorial charm. His younger brother James, an engraver of note, often engraved his brother's pictures. Among his chief works are: "The Cruel Sisters" (1851); "Shakespeare and his Friends at the Mermaid Tavern"; "The Cotter's Saturday Night" (1854); "Catherine Seyton" (1864); "Tam o' Shanter"; "The Stirrup Cup" (1867); "John Anderson, My Jo" (1869); "Blenheim" (1875); "The Great Hall at Haddon" (South Kensington Museum); "Annie's Tryst" and "The Poet's Dream" (National Gallery, Edinburgh); "The Gamekeeper's Daughter"; and "The Hiring Fair."

FAED, Thomas (1826–1900). A Scottish genre and historical painter. He was born at Barlay Mill and was a brother of John Faed, from whom he derived his first instruction. He studied at the Edinburgh School of Design under Sir William Allen and Thomas Duncan. In 1849 he became an associate of the Royal Scottish Academy, and shortly afterward painted his attractive "Scott and his Friends at Abbotsford," widely known through its engraving by his brother James. In 1852 he removed to London, where his reputation was established by his "Mitherless Bairn" (Melbourne Gallery), exhibited in 1855. Among his subsequent works are: "Home and the Homeless" (1856); "The First Break in the Family" (1857); "From Dawn to Sunset" (1861); "Baith Faither and Mither" (1864); "Forgiven" (1876); "The Silken Gown"; "Faults on both Sides"; "The Young Highland Mother"; "The Poor and the Poor Man's Friend"—the four last named in the Tate Gallery, London; and "Rest by the Stile" in the Vanderbilt collection (Metropolitan Museum, New York). Faed was elected a member of the Royal Academy in 1864 and an honorary member of the Vienna Academy in 1875. Owing to the failure of his eyesight, he ceased work in 1892. His pictures are interesting rather for their subjects, sentimental or pathetic incidents in humble Scottish life, than as paintings. They are, however, good in draftsmanship and conscientious in execution. They are very popular and have been much reproduced in engraving.

FAENZA, fä-ĕn′zȧ (Lat. *Faventia*, from *favere*, to favor). An episcopal city of Ravenna, north Italy, on the Lamone (ancient Anemo), 31 miles southwest of Bologna (Map: Italy, C 2). From Faenza comes faïence ware, for the manufacture of which the city was famous in the fifteenth century. On Vittorio Emanuele Square, where the four main streets meet, are the city hall, which was once a palace of the Manfredi, the beautiful church of San Michele, the modern theatre, and the fifteenth-century cathedral of San Costanzo, who was the first Bishop of Faenza. The square is surrounded by arcades and has a seventeenth-century fountain in the centre. The cathedral is a basilica, begun in 1474, containing many works of art, among them a Holy Family by Innocenzo da Imola, and the tomb of St. Savinus by Benedetto da Majano (1472). In the municipal art gallery are paintings by artists of the Romagna, and splendid collections of majolica ware. The city has a library, a gymnasium, a technical school, a lyceum, and a school of design. The most important industries are the manufacture of majolica and faïence ware, furniture, vehicles, dyes, and leather; the spinning and weaving of silk, and sulphur refining. An important trade in wine, silk, and hemp is carried on. In 82 B.C. Faventia was the scene of a victory of Sulla over Carbo, and in 542 A.D. Totila here defeated the Byzantines. Later it became a part of the Exarchate, was captured in 1241 after an eight months' siege by Frederick II, and in 1313 came into the possession of the Manfredi. In 1509 Julius II united it to the Papal States. It is the native place of the physician Toricelli, inventor of the barometer, to whom a monument has been erected. Pop. (commune), 1901, 40,370; 1911, 40,164.

FAERIE (fā′ĕr-ĭ) **QUEENE,** The. An allegorical romance of chivalry, by Edmund Spenser. Of the 12 books contemplated, six were published (1590 and 1596), but only fragments of later books appeared. Each book is divided into 12 cantos, telling the legend of a knight who represents one of the chief virtues—Holiness, Temperance, Chastity, Friendship, Justice, Courtesy. Of another book, on Constancy, only a fragment is extant.

FAESULÆ. See Fiesole.

FAFNIR, fäv′nêr (Icel., Embracer). In Norse mythology, the son of the giant Hreidmar. In the shape of a dragon he guarded the treasure later known as the *Nibelungenhord*, and was killed by Sigurd.

FA′GAN, James Bernard (1873–). An Irish playwright. He was educated at Clongowes Wood College, and at Trinity College, Oxford. He studied law, and engaged in the Indian Civil Service for a time. In 1895–97 he went on the stage with F. R. Benson's company, in 1897–99 played with Beerbohm Tree's company in Her Majesty's Theatre, and in 1913 returned after retirement to play the rôle of the Rt. Hon. Denzil in his own play, *The Earth* (1909). His other plays include: *The Rebels* (1899); *The Prayer of the Sword* (1904); *Under which King* (1905); *Shakespeare versus Shaw* (1905); *Hawthorne, U. S. A.* (1905); *A Merry Devil* (1909); *The Dressing Room* (1910); *Bella Donna*, an adaptation (1911); *The Happy Island* (1913).

FAGEL, fä′kĕl, Frans Nicolaas, Baron (1645–1718). A Dutch general, a nephew of Kaspar Fagel, born at Nimeguen. He distinguished himself at Fleurus (1690) and commanded at the defense of Mons (1691) and at the siege of Namur (1695). As lieutenant general, he led the army at the siege of Bonn (1703) and fought at Eckeren (June 30, 1703). Transferred in 1704 to the army in Portugal, he stormed Valencia (1705) and Albuquerque and besieged Badajoz. Upon his return to Holland he fought at Tournai, Ramillies, and Malplaquet, besieged Béthune, forced the passage of the Scheldt (1712), and captured Le Quesnoy. After the Peace of Utrecht he was Governor of Sluis.

FAGEL, HENDRIK, BARON (1765–1834). A Dutch statesman. He studied at Leyden and in 1787 was appointed second secretary of the States-General. He soon afterward succeeded his grandfather as secretary, being the sixth member of the family to occupy that position since 1672. In 1794 he was appointed, in association with Van de Spiegel, to conclude an alliance with Prussia and England. He shared the exile of the princes of Orange and after his return to Holland in 1813 was Ambassador to England for 11 years. In 1814 he and Castlereagh signed the important Convention of London which restored many Dutch colonies to Holland. He became Minister without portfolio in 1829.

FAGEL, KASPAR (1629–88). A Dutch statesman, born at The Hague. In 1663 he became pensionary of Haarlem, in 1670 secretary of the States-General, and in 1672 grand pensionary to succeed De Witt. He believed in the ability of William of Orange to redeem Holland from its perilous position and with Van Beuningen and Valckenier attached himself to the fortunes of that prince. On his suggestion the hereditary stadtholdership was in 1674 conferred upon William. He prepared the way for the accession of William to the throne of England. He is said to have refused a bribe of 2,000,000 francs from Louis XIV.

FAGERLIN, fä'gĕr-lēn, **FERDINAND JULIUS** (1825–). A Swedish genre painter, born at Stockholm. Originally a shipbuilder, he was later for a time in the military service, but after some amateur work, especially in portraiture, from 1854 adopted art as his profession. After study at the Academy of Stockholm, at the Düsseldorf Academy under Karl Sohn, and under Couture in Paris, he settled in Düsseldorf, where he was appointed to a professorship in the Academy in 1893. He was early influenced by Henry Ritter, and his most important work is done in genre. In particular, his naïve and sympathetic characterizations of Dutch fisher life have ranked him among the principal Swedish artists. His canvases of this sort are generally faithful in detail, touched by a quiet humor, and good in color. They include: "Jealousy" (Stockholm Museum); "The Deserter," "The Return from the Shore," and "A Cosy Home" (Berlin Gallery), and "The Bashful Suitor" (Düsseldorf Gallery).

FAGGING. A term of uncertain origin used in the "public schools" of England. The services of a fag are of two kinds—the one comprising his duties to a special upper-form boy, to whom he has been assigned; the other consisting of those due to the whole of the upper boys. The former comprise such tasks as preparing his master's breakfast, making his master's fire, carrying his master's messages, and smuggling into the house little forbidden delicacies for his master's consumption, and in this instance, if detected, bearing his master's punishment. Those services which a lower boy owes to the whole of the upper boys are summed up in attendance at the games. In the cricket season fags stand behind the wickets to stop the balls while their seniors are practicing; and at all seasons they are liable to the task of waiting attendance on the racket players and retrieving the balls which have been "skyed" out of the court. No boy, however, is liable to an imposition really menial. All cases of difficulty arising out of fagging are within the jurisdiction of the head boy in the house or the head of the school and are settled by reference to the one or the other. Until about 1870 the system of fagging was subject to gross abuses, and, while those who survived may have been the better for the severe discipline, many boys were either driven out of school or carried away lasting impressions of the hardships. The system has, however, been better regulated and with the prefect or monitorial system is probably an important factor in the training of the English "public school" boy. Consult Hughes, *Tom Brown's School Days.*

FAG'GOT WORM. A Ceylonese bagworm (*Eumeta carmerii*), whose pupa case resembles a bundle of small faggots. It occurs on the coffee bushes, and the natives say that they represent the souls of dead men and women who in life were persistent thieves of firewood and are thus punished. See TEA INSECTS.

FAGIN, fā'gin. The Jew in Dickens's *Oliver Twist*, a receiver of stolen goods, who trains up a gang of thieves and pickpockets. He abducts Oliver Twist and is finally condemned to death for murder.

FA'GIUS (Latinization of his German name *Büchlein*), **PAUL** (1504–49). A German divine and Hebraic scholar. He was born at Rheinzabern in the Palatinate. After completing his academic studies at Heidelberg, he removed to Strassburg, where he was a pupil of Wolfgang Capito, the famous Hebraist. In 1537 he became pastor at Isny, where also he received instruction in Hebrew from Elias Levita, whom he brought from Venice to assist him in his studies. He established a Hebrew printing press and published many works of interest to Oriental scholars. His reputation as a Hebraist in 1542 secured for him invitations to the chair of Hebrew at Strassburg, Constance, and Marburg, and after holding professorships in these cities he went to Heidelberg in 1546 to aid the party of the Reformation in the University. After his deposition in 1549 because of his refusal to obey the Interim, he was invited by Archbishop Cranmer to come to England, where he died soon after his arrival at Cambridge. In 1557 his body was exhumed and burned under orders from Queen Mary. He wrote a *Hebrew Grammar* (1543) and various commentaries on the Old Testament—none now of any importance save historically.

FAGNANI, fá-nyä'nē, **JOSEPH** (1819–73). An Italian portrait painter. He was born at Naples, and studied at the Academy there and in Vienna and Paris. He traveled extensively, and came to the United States with Sir Henry Bulwer in 1849. He made portraits of a large number of public characters, among them Victor Emmanuel, Abd-ul-Aziz, Garibaldi, the Empress Eugénie, Ali Pasha, and President Taylor, and painted a series of portraits of the most beautiful women of New York, called "The Nine Muses," which are now in the Metropolitan Museum of Art, New York. His work was popular in his day, but is of mediocre quality and has no enduring value.

FAGNIEZ, fȧ'nyā', Gustave Charles (1842–). A French economist and historian. He was born in Paris and was educated at the Ecole des Chartes and the Ecole des Hautes-Etudes. For a time he was employed in the national archives, and later he became a member of the commission of diplomatic archives under the Minister of Foreign Affairs. He also gave a course at the Sorbonne. He was one of the founders and a president of the Historical Society of France, and one of the editors of the *Revue Historique.* His writings, dealing largely with economic history, include: *Etudes sur l'industrie et la classe industrielle à Paris au XIIIe et au XIVe siècle* (1877); *La mission du père Joseph à Ratisbonne* (1885); *Le père Joseph et Richelieu* (1894); *L'Economie sociale de la France sous Henri IV* (1897); *Documents relatifs à l'histoire de l'industrie et du commerce* (2 vols., 1898–1900); *Le duc de Broglie* (1902); *Corporations et syndicats* (1905).

FAGOTIN, fȧ'gō'tăɴ'. A monkey, famous in Paris for his cleverness in the days of Molière, and frequently mentioned in the literature of that time.

FAGOTTO. See Bassoon.

FAGUET, fȧ'gě', Emile (1847–1916). A French critic, journalist, and literary historian, born at La Roche-sur-Yon. After teaching in the provinces he became professor of poetry at the Sorbonne in 1890 and in 1901 was elected to the Academy. His works include: *La tragédie au XVIe siècle* (1883); *Le théâtre contemporain* (1880–91), comprising his dramatic criticisms; *Dix-huitième siècle* (1890); *Seizième siècle* (1893); *Drame ancien, drame moderne* (1898); *Histoire de la littérature française* (1900); *La politique comparée de Montesquieu, Rousseau et Voltaire* (1902); *Propos littéraires* (1902); *Le Pacifisme* (1908); *Les préjugés nécessaires* (1911); *Monseigneur Dupanloup, un grand évêque* (1914). In 1914 his *Initiation into Literature* and *Initiation into Philosophy* were published in English, trans. by Sir Home Gordon. His style is most modern and vivacious, continually sparkling with brilliant and clever sayings. His hostility to dogmaticism, keen powers of analysis, and richness of personal ideas make him a most constructive critic. By means of his monographs (on most of the literary geniuses of the last five centuries) he rehabilitated especially the literature of the seventeenth century, but he did this at the expense of eighteenth-century writers. He took an active interest in the criticism of the modern drama, of politics, and even of philosophy. Consult V. Giraud, "M. Emile Faguet," in *Revue des Deux Mondes* (Paris, 1909).

FA'GUS. See Beech.

FAHA'KA. A globefish (*Tetraodon fahaka*) of the Nile delta.

FA HIEN, fä hê-ĕn'. A Chinese Buddhist monk and traveler. He was a native of Wŭ-yang, in the Province of Shan-si. During the years 399–414 A.D. he traveled extensively in India, Khotan (Yu-than), where he witnessed a great Buddhist festival, and Tibet in company with Hui King and other Chinese pilgrims. From Khotan he journeyed through Kashmir, Kabul, Kandahar, and the Punjab, to Central India, which he reached in 405, after six years of wandering. He remained in India for about 10 years, seeking complete copies of the *Vinaya-piṭaka* and compiling information regarding Buddhism and the life of its founder, and then went to Ceylon where he copied many sacred texts. From there he embarked for Java, and arrived at his home in China once more in 414. After his return he wrote an account of his travels, called *Fô-kue-ki,* or story of the Buddhist countries. This journal is concise and chiefly taken up with a description of the sacred spots and objects of the Buddhist faith, which was at that time the dominant religion in India. The narrative has been translated into French by Rémusat (Paris, 1836) and into English by Beal (2d ed., London, 1884), Giles (Shanghai, 1877), and Legge (Oxford, 1886). He died in the monastery of Sin at the age of 88 years. Consult the introduction to Legge's translation; Beazley, *Dawn of Modern Geography,* vol. i (3 vols., Oxford, 1904–06); Giles, *History of Chinese Literature* (New York, 1901).

FAHLCRANTZ, fäl'krȧnts, Christian Erik (1790–1866). A Swedish poet and theologian, born at Stora Tuna (Province of Falun). He wrote several long poems and some controversial works. From 1839 to 1852 he published, with the collaboration of Knös and Almqvist, an *Ecclesiastical Journal.* In 1849 he was made Bishop of Westerås. His most important work is *Noach's Ark* (1825–26), a humorous and satirical poem. Besides this may be mentioned *Ansgarius* (1835–46). The collected works of Fahlcrantz have been published under the title *C. E. Fahlcrantz: Samlade Skrifter* (7 vols., Oerebro, 1863–66).

FAHLCRANTZ, Karl Johan (1774–1861). A Swedish landscape painter, brother of the preceding, born at Stora Tuna. He was a pupil of Ljung, but studied directly from northern scenery and later imitated Ruysdael and Everdingen. He had the exaggerated enthusiasm for Nature typical of the Romantic school, and idealizes, intensifies, and strives after the fantastic. His color is warm though dark in tone, and at his best his pictures are full of sentiment. The most popular are those illustrating Tegnér's *Frithjof Saga.* The Stockholm Museum possesses the "Castle of Kalmar in the Moonlight" and a landscape; the Christiania Gallery, "A Forest Site."

FÄHLMANN, fāl'mȧn, Friedrich Robert (1800–50). A Russian philologist. He was born in Esthonia and studied medicine and philology at Dorpat, where in 1842 he became lecturer on the Esthonian language. He collected and edited the material constituting the *Kaleviade* or *Kalevipoeg* (The Son of Kalev), which was published after the death of Fählmann by his biographer, Kreutzwald (1857–61).

FAHNE, fä'ne, Anton (1805–83). A German jurist and historian. He was born at Münster and was educated in medicine, theology, and law at Bonn and Berlin. He wrote many special histories of bishoprics, cities, and noble families which contributed valuable details to the history of Westphalia and the Rhine District. These works include: *Forschungen aus dem Gebiet der rheinischen und westfälischen Geschichte* (5 vols., 1864–75); *Denkmale und Ahnentafeln in Rheinland und Westfalen* (6 vols., 1879–83); and the interesting book on Livonia, entitled *Livland: Ein Beitrag zur Kirchen- und Sittengeschichte* (1875).

FAHRENHEIT, fä'ren-hīt, Gabriel Daniel (1686–1736). A German physicist, who made several important improvements in the thermometer. He was born in Danzig. His inclination for scientific research induced him to give up mercantile pursuits, and, having traveled through Germany and England, he settled in Holland, becoming a manufacturer of meteorological instruments. In 1720 he was the first to bring about the general practice of using mercury instead of alcohol in the construction of thermometers, which had been originated by Boilliou in 1659. With the new mercury thermometers the accuracy of the instrument was very much improved, and this was partly secured through a method for cleaning the mercury invented by Fahrenheit. He also devised the scale of graduating the thermometers known by his name and discovered that other liquids besides water had a fixed boiling point, and that the boiling point varied with a change in the pressure of the atmosphere. (See THERMOMETER.) In 1724 Fahrenheit was elected a fellow of the Royal Society of London, and the *Philosophical Transactions* of that year contain five short papers by him on physical subjects. These, with articles on thermometry by Reaumur and Celsius translated into German, are to be found in *Ostwald's Klassiker, No. 57* (Leipzig, 1894).

FAIDER, fä'dĕr, CHARLES JEAN BAPTISTE FLORENT (1811–93). A Belgian jurist and statesman, born at Triest. He was admitted to the bar in 1832, in 1844 became Advocate-General in Brussels, in 1846 a member of the Royal Academy, and in 1851 Advocate-General in the Court of Cassation, to which post he returned after being Minister of Justice (1852–55). He published an *Histoire des institutions politiques de la Belgique* (1874) and other works on constitutional law.

FAIDHERBE, fä'dârb', LOUIS LÉON CÉSAR (1818–89). A French soldier, born at Lille. He began his military career in Algeria, was a captain in Guadeloupe in 1848 and in Algeria in 1851–52, and in 1854 was made Governor-General of French Senegal, where he reorganized the government and extended the French territory, by waging a war of extermination against the Prophet El-Hadji Omar, who had formed the project of driving out all foreigners and founding an immense Mohammedan empire in Central Africa. A satisfactory treaty was made with Omar in 1863. In the war with Germany Faidherbe received from Gambetta the command of the Army of the North and fought bravely against odds at Bapaume and at Saint-Quentin. In 1871 he was a member of the National Assembly and in 1879 was elected a senator. He was the author of valuable works on the geography, anthropology, and philology of Senegal and Algeria, including *Epigraphie phénicienne* (1873); *Instructions sur l'anthropologie de l'Algérie* (1874); *Essai sur la langue poul* (1875); *Le Zénaga des tribus sénégalaises* (1877); *Langues sénégalaises* (1887); *Le Sénégal* (1889). His military memoirs, *Campagne de l'armée du Nord* (1871) aroused Von Goeben to a reply from the German point of view. Consult Brunel, *Le général Faidherbe* (2d ed., Paris, 1897).

FAÏENCE, fä'äns' (Fr. from It. *faenza,* faïence, for *porcellana di Faenza,* earthenware of Faenza, a city of Italy). Properly speaking, the term should refer to majolica manufactured at Faenza. At the time when the Italian potters introduced this ware into France Faenza was the most important centre of the manufacture in Italy. The term was therefore adopted as the designation for all manner of pottery other than unglazed pottery or porcelain. It is used in English to designate any earthenware of coarse fabric, covered with an opaque enamel (upon which decoration may be applied in vitrifiable paint) and fired. The process of manufacture includes three wholly distinct operations—the molding and firing of the original clay, often not more delicate than a cheap flowerpot; the covering with enamel, which is often done by mere dipping, and the firing of this; and, finally, the decoration, which is subsequently fired. The famous majolica (q.v.) is therefore a variety of faïence in the English sense; while stoneware, including the so-called *faïence Henri Deux* and *faïence Saint-Porchaire* (q.v.), is not properly faïence in the English sense; neither are porcelain or other wares not covered all over with a thick enamel, including those decorated with slip, and all the varieties of Greek vases and Japanese hard, yellow pottery with crackled glaze. On the other hand, tiles and bricks, of which the surface is covered with an opaque material upon which alone the painting is applied, as in the monuments of the early Persian kingdoms, in many of those of Egypt, and in the splendid tiles which sheathe and line the walls of mosques in Cairo and Damascus, are faïence in the strictest sense.

The wares to which the term is most commonly applied in the language of students of pottery are the French pieces of the sixteenth, seventeenth, and eighteenth centuries. These are especially the manufacture of Rouen, which as early as 1520 was turning out tiles of great beauty, including frequently painting in figure subjects, and in those curiously emblematic compositions which were the delight of designers of that time. The most important development began in the late seventeenth century. These wares were sometimes plain white and blue, and are then of extreme beauty, not closely copied from Chinese originals, like the Delft pieces named below, but designed with great freshness and novelty in the spirit of the French Renaissance. At a later time deep red was introduced, so that the three colors—red, blue, and white—were somewhat easily balanced in the composition, which was in a few cases relieved by gold. These pieces were made for table use even in the wealthiest families, and during the wars of Louis XIV's reign, when it became fashionable to send silverware to the mint, splendid services were made for the royal establishment at Versailles and for the nobles of the court. The exclusive taste for this ware disappeared at the time of the discovery of what is called soft porcelain at the close of the eighteenth century; but the factories flourished down to the end of the eighteenth century and left their traces in the peasant potteries of the Cevennes and the south. In the mountain regions of Italy very interesting faïence is still made by village potters on good old lines of decoration.

One of these famous wares is that of Nevers, which is marked by a much freer use of landscape designs than that of Rouen, and, when the composition is not actually pictorial, by a much less restricted and carefully designed style of ornamentation, as if copied from the most elaborate designs for brocade. The factory seems to have been established about 1550, and it flourished as late as that of Rouen, though it was never equally extensive. The vases and dishes of Moustiers are famous for their exquisite decoration in conventional flowers arranged in scrolls and festoons, these last being the especial mark of the richer pieces. There are also splendid pieces with coats of arms and a conventional decoration of great solidity and dignity, reminding the student of the finest ware of Rouen. The first manufactory was established at Moustiers-Sainte-Marie in Provence about 1640. There are famous wares which were made in Alsace, at Strassburg, and Niederweiler, and also at Marseilles, where realistic flowers of large size were painted on plates and dishes in a most effective way. Lunéville and Saint-Clément in Lorraine, Rennes in Brittany, Lille, and Valenciennes in the extreme north of France, Lyons, and, in the neighborhood of Paris, Sceaux, Sèvres, Montereau, and many other places, were famous throughout this epoch.

During the same period the manufacture of faïence at Delft in Holland assumed great importance. Beginning about 1600, it produced the most perfect works from about 1650 till early in the eighteenth century. The great popularity of the ware then led to overproduction and artistic decline, and at the end of the century it was replaced by the more practicable porcelain. In late years, however, the manufacture has been revived. In Delft the decoration was usually painted in blue upon the white enamel after the first firing. It was then covered with transparent lead glaze and fired a second time. Some pieces were closely copied from blue and white Chinese porcelain, the resemblance being never complete, because of the different effect of the white background, and also of the blue painting from that of the Chinese ware, but having an especially attractive appearance of its own. There were landscapes often of large size and painted on plaques, square and oblong, of considerable size, often let into chimney pieces above the fireplace and the like, and also scenes of domestic life, real genre painting, but usually confined to pure blue and white; and similar subjects were painted on small tiles, four or six inches square, many tiles being included in one design. Finally, there are the imitations of the splendid wares of Rouen and other French manufactories, in which case several colors are used. The ware was exported in such immense quantities as to give the name "Delft" to any faïence used in England, and a similar name, spelled "Delphes" or in some such way, in France. The well-known ware manufactured at Lambeth (now a part of London) is a variety of Delft, which was produced throughout the seventeenth century, as were also similar wares at Bristol and Liverpool. Delft ware was manufactured in Germany at Hanau, Frankfort, and Cassel.

Faïence, in the strict sense, was less common in the nineteenth century, because much tougher wares were made. The beautiful dishes of Delft and Rouen break very easily and are too soft to be repaired in a lasting way. In France, however, many beautiful wares of this kind were made for table use. A breakfast set in faïence, with delicate white glaze of peculiar softness, and painted with realistic flower pattern, would cost only half as much as a porcelain set, no more attractive to the eye, but harder, and, on the whole, more agreeable in use as well as more enduring. In Italy several factories produce modern imitations of ancient majolica and other pieces designed more or less in close agreement with ancient work; and these are genuine faïence. Most generally, however, the choicer modern wares, whether for use or adornment, are of some variety of stoneware, of "ironstone china," of terra cotta, or of porcelain. See MAJOLICA; PORCELAIN; POTTERY; STONEWARE.

The best collections of French faïence are in the Musée de Cluny (Paris), in the Louvre and at Sèvres, and also in the French provincial museums; of the Delft ware in the museums of The Hague and Amsterdam, as well as in one of the manufactories at Delft. There are also good collections in the Victoria and Albert and British museums, London, and in the Morgan collection (Metropolitan Museum, New York).

Consult: Garnier, *Dictionnaire de la céramique* (Paris, 1893); Ris-Paquot, *Manuel du collectionneur des faïences anciennes* (ib., 1877); Deck, *La faïence*, a volume of the *Bibliothèque de l'enseignement des beaux-arts* (ib., 1887), by a practical workman of merit; Gasnault and Garnier, *French Pottery* (London, 1884); Milet, *Historique de la faïence et de la porcelaine de Rouen* (Rouen, 1898); Abbe Requin, *Histoire de la faïence artistique de Moustiers* (Paris, 1903); Solon, *The Old French Faïence* (London, 1903), the best manual in English. For Delft ware, consult Havard, *Histoire de la faïence de Delft* (Paris, 1878).

FAILLON, fȧ'yôɴ', MICHEL ETIENNE (1799–1870). A French missionary and author, born at Tarascon, France. He became a Sulpician monk in Paris, taught in Paris and Lyons, and in 1854 went to Canada on a tour of inspection of the various houses of that order in America. He had been in Canada before in 1849–50, and he was there again in 1857–62. His contributions to Canadian religious biography embrace lives of *Margaret Bourgeoys*, founder of the Congregation Sisters (1854); *Madame d'Youville*, founder of the Grey Sisters (1852); *Mademoiselle Maur*, founder of the Hôtel Dieu (1854); *Mademoiselle le Ber*, the recluse (1860); *Histoire de la colonie française en Canada* (3 vols., 1865–66), bringing the narrative to 1675.

FAILLY, fȧ'yé', PIERRE LOUIS CHARLES DE (1810–92). A French soldier. He was born at Rozoy-sur-Serre, was educated at the military school at Saint-Cyr, and joined the army in Algeria. At the outbreak of the Crimean War he was made a brigadier general. He commanded a division in the Italian campaign in 1859 and fought at Magenta and Solferino. In 1867 he commanded the corps sent to aid the Pope against Garibaldi, whom he defeated at Mentana on November 4. At the beginning of the Franco-Prussian War Napoleon placed him in command of the Fifth Army Corps. On August 30, 1870, while commanding the right wing of MacMahon's army at Beaumont, he was surprised and forced to retreat, leaving MacMahon's flank unprotected, and cutting off his retreat, which forced capitulation after the battle of Sedan. Failly was relieved of his command on the morning of the battle, being succeeded by General Wimpffen. After the war he lived in retirement. He published a defense of his military operations before Sedan, *Campagne de 1870: Opérations et marche du 5ème Corps jusqu'au 31 août* (1871).

FAILS'WORTH. A town of Lancashire, England, on the Lancashire and Yorkshire Railway, 4 miles northeast of Manchester. It has extensive cotton-manufacturing industries. The district gets its water and gas from Oldham, while the corporation of Manchester supplies a tramway service and electric lights. Pop., 1901, 14,152; 1911, 15,098.

FAILURE OF DAMS. See DAMS AND RESERVOIRS.

FAIN, fäɴ, AGATHON JEAN FRANÇOIS, BARON (1778–1837). A French historian, secretary to Napoleon I. He was born in Paris. After having served under the Directory, he was in 1806 appointed secretary of the Imperial archives, in 1809 was made Baron, and in 1813 became private secretary to the Emperor, whom he accompanied on all his tours until 1815, when he drew up the papers in which Napoleon definitely abdicated the throne of France. In 1830 he became first secretary of the cabinet under Louis Philippe, and was several times intrusted with the administration of the Civil List. He was deputy from Montargis in 1834–37. He wrote some readable and accurate memoirs, dealing chiefly with the later years of the reign of Bonaparte, such as *Manuscrit de 1814, contenant l'histoire des six derniers mois du règne de Napoléon* (1823; 4th ed., 1906); *Manuscrit de 1813* (2 vols., 1824; 2d ed., 1825); *Manuscrit de 1812* (2 vols., 1827); *Manuscrit de l'an III* (1828). Fain's *Mémoires,* published in 1908, constitute a valuable addition to his earlier works.

FAINÉANT, fā'nā'äɴ', LE NOIR (Fr., the black sluggard). A name given in Scott's *Ivanhoe* to Richard Cœur de Lion, disguised as the Black Knight.

FAINÉANTS, fā'nā'äɴ' (Fr., do-nothings). A designation especially applied to the later Merovingian sovereigns of France, in whose name the mayors of the palace really governed the country. See MAJOR DOMUS.

FAINT'ING (from OF. *faint, feint,* p.p. of *feindre,* to feign, from Lat. *fingere,* to fashion), or SYNCOPE. Loss of consciousness, of sensation, and of power of motion, with pallor of the face, temporary cessation of respiration, and temporary feebleness of the heart, with loss of pulsation at the wrist. It is caused by anæmia of the brain, due to temporary heart failure from shock, great weakness or exhaustion, loss of blood, or disease of the heart. Sudden emotion, as fright, excessive joy or grief, may cause fainting in a neurasthenic person. In all cases of fainting the clothing which may impede breathing should be loosened, and the patient should be placed on the back, with the head and chest lower than the abdomen and legs. In a protracted faint whisky may be drank and ether, camphor or strychnia may be given hypodermatically. In heart disease and in severe injuries the patient may die without regaining consciousness. See HEART, DISEASES OF THE.

FAIR (OF. *feire, foire,* Fr. *foire,* It. *fiera,* fair, from Lat. *feria,* holiday; connected with Lat. *festus,* feast). A meeting held for the purpose of exhibiting or selling goods. Originally fairs were held at stated times and places, some for the sale of a particular class of merchandise, others for the sale of goods of a general character. People resorted to them to exchange goods and to collect their stores to last for several months. Princes and the magistrates of cities encouraged them, and some of the privileges granted still remain in places. With the crowding together of people in large cities and the rise in rent, the collection of a store of goods to last longer than a few days became impossible, so the original function of the fair ceased to exist. They flourish mostly to-day on the outskirts of civilization, where the means of communication are defective. In Europe they appear to have originated in the church festivals, which were found to afford the best opportunity for commercial transactions, the concourse of people being such as took place upon no other occasions. In Western Europe the goods exposed for sale are chiefly those of which there is a frequent change of fashion. Provisions are seldom an article of sale in them; and while in some parts of the Continent persons of all ranks still wait for the great yearly fairs to make their principal purchases of articles of every description, such as corn, wine, spirits, tea, coffee, etc., these articles are seldom seen in them.

One of the most noted of English fairs was that of St. Bartholomew, Smithfield, London, founded at the beginning of the twelfth century. They grew in importance in the twelfth and thirteenth centuries, but declined in the fifteenth century, and at the close of the reign of Queen Elizabeth they had degenerated into resorts for pleasure seekers. The Bartholomew, Greenwich, Glasgow, and Donnybrook fairs are examples of these.

The greatest fairs in Germany are those of Leipzig, Frankfort on the Main, Frankfort on the Oder, and Brunswick. At the first-named meetings are held three times a year—New Year's, Easter, and on the Feast of St. Michael—and it is estimated that $50,000,000 worth of goods are sold. Other noted European fairs are those of Zurzach in Switzerland, Budapest in Hungary, Sinigaglia and Teramo in Italy, Beaucaire and Lyons in France, and Nizhni Novgorod in Russia. The last named, beginning in July and lasting eight weeks, is frequented by buyers and sellers from all parts of Europe and northern and central Asia, and it is said that merchandise to the value of over $100,000,000 is sold. Outside of Europe the most important fairs are those of Tanta in Upper Egypt, Kiakhta and Irbit in Siberia, Hurdwar in India, and Mecca in Arabia. The last-named fair is held at the time of the annual pilgrimage, and over 100,000 people visit it.

In the United States there are no fairs of the kind that have been common in the Old World; but the term is applied to a variety of exhibitions, such as church, charity, and agricultural fairs, and local, State, national, or international expositions or fairs. In fact, the term is applied to all exhibitions where people are expected to bestow patronage or to make purchases. At church or charity fairs articles, chiefly of the fancy sort, are sold. The most common kind are the agricultural fairs, county and State. Elkanah Watson, a prosperous merchant of Albany, N. Y., was the originator of these. Mainly through his influence the New York Legislature appropriated, in 1819, $10,000 a year for six years, for premiums on agricultural products and family manufactures. Since then annual State fairs have become quite general, and many States appropriate funds to aid them. The most common fairs are the annual county fairs, where live stock and all kinds of vegetable products and manufactured goods are exhibited, and premiums are awarded to the possessors of the best grades. These fairs are not held primarily for the purpose of selling commodities at the fair, but largely for advertising purposes. The city street fairs, where amusements of various kinds are furnished, are intended to promote the welfare of the city by attracting traders to them.

The world's fairs or expositions (see Exhibitions), and the international or State fairs, which have become famous within the last half century, are chiefly educational in character and are adapted to the commercial life of the present, with its rapid means of communication, its populous cities, and production on a large scale, as the old fair, with its convenient meeting ground for buyers and sellers, was adapted to the commercial life of a few centuries ago. These fairs are intended to promote the interests of the city and nation or State in which they are held and to furnish an excellent opportunity for the advertisement of all classes of goods. While commodities are sold at these fairs, the primary purpose of them is to advertise.

FAIR, James Graham (1831–94). An American capitalist, born near Belfast, Ireland. He came to the United States in 1843 and went to California on the breaking out of the gold fever in 1849. After 1860 he was engaged in the mining of gold and silver in Nevada and amassed great wealth. In 1867 he entered into partnership with J. C. Flood, W. T. O'Brien, and J. W. Mackay in several large mining projects. He was elected as a Democrat to the United States Senate in 1881 and served one term (1881–87).

FAIR'BAIRN, Andrew Martin (1838–1912). Principal of Mansfield College, Oxford. He was born near Edinburgh, and was educated at Edinburgh, Glasgow, and Berlin universities. He commenced his ministry in 1860 at Bathgate, removed to Aberdeen in 1872, became principal of Airedale College, Bradford, England, in 1877, lecturing at Edinburgh (1881–83) on the "Comparative History of Religions." In 1883 he was selected as chairman of the Congregational Union of England and Wales, and in 1886 removed to Oxford, to become the principal of Mansfield College. He made several lecturing visits to the United States and published, among other books: *Studies in the Philosophy of Religion and History* (London, 1876); *Studies in the Life of Christ* (1881); *The City of God* (1883); *Religion in History and in the Life of To-Day* (1884); *The Place of Christ in Modern Theology* (1893); *Catholicism, Roman and Anglican* (1899); *The Philosophy of the Christian Religion* (1902). He was a member of the Welsh Church Commission appointed in 1906.

FAIRBAIRN, Patrick (1805–74). A clergyman of the Free Church of Scotland, born at Hallyburton, Berwickshire. He was educated at Edinburgh, and licensed to preach in 1826. When the disruption occurred (1843), he joined the Free Church. He became professor of divinity in the Free Church College in Aberdeen (1853), was transferred to the similar institution in Glasgow (1856), and made principal the same year. His biblical works had a wide circulation, but possess little permanent value. His reputation rests upon his *Typology of Scripture* (1845–47; 6th ed., 1880); *Prophecy* (1856; 2d ed., 1866); *Hermeneutical Manual* (1858); *Pastoral Theology* (1875), with sketch of his life by J. Dodds.

FAIR'BAIRN, Sir William (1789–1874). An English engineer, born at Kelso in Roxburghshire, Feb. 19, 1789. He learned a little reading, writing, and arithmetic at the parish school of Mullochy in Ross-shire, and after some six months' instruction from an uncle he was apprenticed to a machinist at Percymain Colliery, North Shields. When his apprenticeship terminated, Fairbairn worked for two years in London and then visited many places in England, Wales, and Ireland, working a short time at each, in order to observe the various practices of different localities. Eventually he commenced business on his own account in Manchester in 1817. The first great improvement introduced by Fairbairn was the substitution of iron for wood in the shafting of cotton mills, and the substitution of light for heavy shafting where metal was already in use. This exchange economized the cost of machinery and enabled the shafting to be speeded from 40 to 160 revolutions per minute. Fairbairn was among the earliest of the iron ship builders and originated various improvements in ship construction.

The first idea of a tubular bridge across the Menai Strait was due to Robert Stephenson, but its realization was largely due to Fairbairn. He was president of the British Association for the Advancement of Science (1861–62) and was created Baronet in 1869. His son Thomas was chairman of the art treasures exhibition at Manchester (1857), was a commissioner for the exhibitions of 1851 and 1862, and was in 1857 offered the honor of knighthood, which he declined. Fairbairn published: *On Canal Steam Navigation; The Strength and Other Properties of Hot and Cold Blast Iron; The Strength of Iron at Different Temperatures; The Strength of Locomotive Boilers; the Effect of Repeated Meltings on the Strength of Cast Iron; The Irons of Great Britain; The Conway and Britannia Tubular Bridges; Useful Information for Engineers*, 1st, 2d, and 3d series; *A Treatise on Mills and Mill Work.* Consult Pole, *Life of Sir William Fairbairn, Bart.* (London, 1877), and Smiles, *Lives of the Engineers* (ib., 1874).

FAIRBANKS. An incorporated city situated on the Tanana River, Alaska, practically at the head of navigation (Map: Alaska, K 3), and the largest city in the Territory, having a population of 3541 in 1910. It is the site of the Fourth Judicial District and of government activities in the interior of Alaska. Its importance arises from its being the commercial centre of the Fairbanks gold-mining district. The Tanana Valley Railroad, 45 miles in length, connects it with Chena (pop., 138 in 1910), and with the principal mining camps of the adjacent regions. Fairbanks is a modern city, being largely heated by a central steam plant; has schools, churches, hospitals, wireless and telegraph connection with the world; has newspapers, long-distance telephone system, fire department, and an electric plant that not only serves the city, but also furnishes light and power to adjacent mining camps. It is reached during the entire year by a stage service of 354 miles from Valdes, and during five months in summer has steamboat service westward to St. Michael and eastward to Dawson and White Horse, Yukon Territory. The gold output of the Fairbanks district averaged annually, from 1906 to 1908, $9,000,000. It has lately fallen off through the exhaustion of bonanza placers, but lode mining is steadily increasing in production. Among the railway lines to be built by the United States, under the Act of Congress of April, 1914, the principal section is one from Chitina to Fairbanks, 313 miles, at a cost of $14,000,000. The route recommended is via the Copper River valley and Delta Pass, although an alternate route was considered from Seward via the valleys of the Susitna and the Nenana rivers.

FAIR'BANKS, Arthur (1864–). An American teacher and author. He was born at Hanover, N. H. After graduating at Dartmouth College in 1886, he studied at Union Theological Seminary and the Yale Divinity School, and received the degree of Ph.D. from Freiburg in 1890. He taught at Dartmouth, Yale, and Cornell, was professor of Greek literature and archæology in the University of Iowa from 1900 to 1906, and then for a year held the chair of Greek and Greek archæology at the University of Michigan. In 1907 he was elected director of the Boston Museum of Fine Arts. Among his writings are: *Introduction to Sociology* (1896; 3d ed., 1901); *First Philosophers of Greece* (1898); *A Study of the Greek Pæan* (1900); *The Mythology of Greece and Rome* (1907); *Handbook of Greek Religion* (1910).

FAIRBANKS, Charles Warren (1852–1918). An American lawyer and public official, born near Unionville Centre, Ohio, a descendant of one of the first settlers of Dedham, Mass. He graduated at Ohio Wesleyan University in 1872, was admitted to the Ohio bar in 1874, managed W. Q. Gresham's campaign for the Republican presidential nomination in 1888, and in 1892 and 1898 was chairman of the Republican State Convention. In 1897 he was elected to the United States Senate from Indiana, and in 1898 he was appointed a member of the British-American Joint High Commission for adjusting Canadian questions, serving as chairman of the commissioners for the United States. In 1903 he was reëlected to the United States Senate, and in 1904 he was elected vice president of the United States.

FAIRBANKS, Douglas (1883–). American actor and motion picture star, born at Denver, Colorado, May 23, 1883. He was educated at Jarvis Military Academy, East Denver High School, and School of Mines. He was married in 1907, but divorced in 1918. In 1920 he married Mary Pickford, motion picture favorite. He made his first appearance in New York in 1901. He starred in *Hawthorne of the U. S. A.*, *Frenzied Finance*, *The Mark of Zorro*, *The Three Musketeers*, etc. He has starred in motion pictures for several years and has been the head of his own producing company since 1916.

FAIRBANKS, Henry (1830–). An American clergyman and inventor, born at St. Johnsbury, Caledonia Co., Vt., the only son of Thaddeus Fairbanks. He graduated at Dartmouth College in 1853 and studied at Andover Theological Seminary. After his ordination in 1858 he entered the service of the Vermont Missionary Society. He was professor of natural philosophy at Dartmouth College in 1859–65 and of natural history in 1865–68. In 1869 he patented a scale for weighing grain and subsequently perfected and patented 34 additional inventions of various kinds.

FAIRBANKS, Thaddeus (1796–1886). An American manufacturer and inventor, born at Brimfield, Mass. In 1824 he entered into partnership with his brother Erastus, under the style of Erastus and Thaddeus Fairbanks, in the manufacture of stoves and plows, the patterns for which were planned and made by Thaddeus. He patented a cast-iron plow in 1826 and in 1831 a hemp dresser. Realizing the difficulty of weighing the rough hemp, the only scale then in use being the even balance and the Roman steelyard where the short arm carried the loaded wagon either on a large platform or by chains attached to the axles, he constructed a platform scale on which an entire load could be weighed at one time. Thenceforth the brothers devoted themselves exclusively to the manufacture of scales in great variety, from the most delicate instruments for the use of chemists and jewelers to those for railroad tracks and canal weighlocks. He founded and liberally supported St. Johnsbury Academy.

FAIR'BURY. A city in Livingston Co., Ill., 60 miles east of Peoria, on the Toledo, Peoria, and Western and the Wabash railroads (Map: Illinois, H 4). It is in a rich farming country, producing large quantities of corn; coal is mined, and there are grain elevators, flour and sorghum mills, machine shops, and cement works. The city contains a public library and owns its water works. Pop., 1900, 2187; 1910, 2505.

FAIR'BURY. A city and the county seat of Jefferson Co., Neb., 57 miles southwest of Lincoln, on the Chicago, Rock Island, and Pacific, the Burlington, and the St. Joseph and Grand Island railroads, and on the Little Blue River (Map: Nebraska, H 4). It is a division point on the Chicago, Rock Island, and Pacific, and has manufactures and extensive nurseries. The city contains a Carnegie library and fine post-office building. It owns its water works and electric-light plant. Pop., 1900, 3140; 1910, 5294.

FAIR'CHILD, Charles Stebbins (1842–1924). An American lawyer and financier, born at Cazenovia, N. Y. Graduating from Harvard (A.B. 1863; LL.B., 1865), he was admitted to the bar in 1866. Thereafter he was Deputy Attorney-General of New York (1874), Attorney-General from 1876 to 1878, from 1885 to 1887 Assistant Secretary of the Treasury, and from 1887 to 1889 Secretary of the Treasury in Cleveland's first cabinet, succeeding Daniel Manning. He was a member of the Monetary Commission appointed by the Indianapolis Monetary Conference in 1897. From 1879 to 1905 he was president of the New York Security and Trust Company, and later he held high offices in other corporations.

FAIRCHILD, David Grandison (1869–). An American botanist, born at East Lansing, Mich. He graduated from Kansas State Agricultural College in 1888, and also studied at the Naples (Italy) Zoölogical Station, at several foreign universities, and at the Buitenzorg (Java) Botanical Gardens. He became botanist of the United States Department of Agriculture in 1889. In 1897 he organized what is now the office of Seed and Plant Introduction and Distribution of the Department of Agriculture and in 1906 he took full charge of this work. Having assisted (1898–1903) Barbour Lathrop in four foreign agricultural explorations conducted in search of new economic plants, he afterward was placed at the head of these researches. His publications include bulletins of the United States Department of Agriculture on plant diseases, microscopic fungi, and marine algæ, and also papers in various botanical proceedings and journals.

FAIRCHILD, George Thompson (1838–1901). An American educator. He was born at Brownhelm, Lorain Co., Ohio, and graduated in 1862 at Oberlin College (Ohio) and in 1865 at Oberlin Theological Seminary. He was instructor and later (1865–79) professor of English literature in the Michigan Agricultural College and from 1879 to 1897 president of the Kansas Agricultural College. In 1898 he became vice president and professor of English literature in Berea College (Kentucky), where he remained until his death. He was ordained in 1871 to the ministry of the Congregational church. In 1897 he was elected president of the American Association of Agricultural Colleges and in 1900 published *Rural Wealth and Welfare.*

FAIRCHILD, Herman LeRoy (1850–). An American geologist, born at Montrose, Pa. Graduating from Cornell University in 1874, he taught for one year at Kingston, Pa., was lecturer in New York City schools (1876–88) and professor of geology at Cooper Union (1878–88), and then went to the University of Rochester to be professor of geology and natural history, and, after 1896, of geology alone. He was general secretary (1894) and a vice president (1898) of the American Association for the Advancement of Science, and secretary (1885–88) and president (1912) of the Geological Society of America, and in 1911 president of the Commission Government Association of New York State. Besides preparing a *History of the New York Academy of Science* (1887) and editing Le Conte's *Elements of Geology* (1903), he is author of more than 100 monographs and articles on biological and geological subjects, especially on the glacial geology of New York State—a field of research in which he made valuable contributions.

FAIRCHILD, James Harris (1817–1902). An American clergyman and educator, born at Stockbridge, Mass. He graduated at Oberlin College in 1838, was appointed a tutor there in the same year, and was ordained to the ministry in 1841. He was professor of languages at Oberlin in 1842–47, professor of mathematics in 1847–58, and professor of moral philosophy and theology in 1858–66. From 1866 until his resignation in 1889 he was president of the college. He became professor of theology in the Oberlin Theological Seminary in 1898 and later professor emeritus. His publications include *Moral Philosophy* (1869; rev. ed., 1892, as *Moral Science: or the Philosophy of Obligation*), and *Oberlin: The Colony and the College* (1883).

FAIRCHILD, Lucius (1831–96). An Amercan soldier. He was born at Franklin Mills, now Kent, Ohio; removed to Madison, Wis., in 1846; spent six years (1849–55) in California; then returned to Madison, studied law, and was admitted to the bar in 1860. At the outbreak of the Civil War he was made captain of the First Wisconsin Regiment and subsequently became its colonel and a captain in the regular army, resigning both commissions in 1863. At Bull Run he commanded the famous Iron Brigade, and at Gettysburg was severely wounded while leading a charge at Seminary Ridge. In 1863 he was commissioned brigadier general of volunteers, but resigned in the same year. Afterward he served for three terms as Governor of Wisconsin, was appointed Consul at Liverpool in 1872 and Consul General at Paris in 1878, and was Minister to Spain from 1880 to 1882. In 1886 he was elected commander in chief of the Grand Army of the Republic.

FAIR′CLOUGH, Henry Rushton (1862–). An American classical scholar. Born near Barrie, Ontario, Canada, he graduated in 1883 from the University of Toronto, but came to the United States and, after further study at Johns Hopkins, was associate professor and professor of classical literature at Leland Stanford Junior University (1893–1902) and professor of Latin after 1902. He was also professor of Latin in the summer schools of the University of Wisconsin (1906), Columbia (1908), and Chicago (1910), and was professor in the American School of Classical Studies, Rome, in 1910–11. In 1907–08 he was president of the Pacific coast branch of the American Philological Association. He served as editor in chief of the *Students' Series of Latin Classics* and is author of *The Attitude of the Greek Tragedians toward Nature* (1897); *The Andria of Terence* (1901); *The Connection between Music and Poetry in Early Greek Literature* (1902); *The Antigone of Sophocles* (1903); *The Trinummus of Plautus* (1909).

FAIR′FAX, Donald McNeill (1822–94). An American naval officer, a member of the famous Fairfax family of Virginia. He became a midshipman in the United States navy in 1837 and served under Dupont on the Pacific coast during the Mexican War. He was promoted lieutenant in 1851 and commander in 1862. He commanded the *Cayuga*, of the Gulf squadron, under Farragut, in 1862, and in 1863 was transferred to the South Atlantic squadron, in which he successively commanded the *Nantucket* and the *Montauk* in the attacks of Dupont and Dahlgren on Charleston. In 1864–65 he was placed in command of the Naval Academy. He attained the rank of captain in 1866, of commodore in 1873, and of rear admiral in 1880, retiring in 1885.

FAIRFAX, Edward (?–1635). An English author, best known as the translator of the *Gerusalemme Liberata* of Tasso. He was born at Leeds, Yorkshire, and lived as a scholar and writer, chiefly at Fuiston, in the same county. He wrote 12 eclogues, of which two have been published, and also, it is said, a *History of Edward, the Black Prince,* never printed. His rendering of Tasso appeared in 1600, as *Godfrey of Bulloigne; or the Recoverie of Jerusalem,* and was dedicated to the Queen. Charles I found solace in perusing it during his last days in prison. The translation is in pentameter verse and continues to be the best English version. It was edited, in 2 vols., by S. W. Singer in 1817.

FAIRFAX, Thomas, third Lord Fairfax (1612–71). An English Parliamentary general, better known as Sir Thomas Fairfax. The son of Sir Ferdinando (afterward second Lord) Fairfax, he was born at Denton, Yorkshire, Jan. 17, 1612. After receiving his education at St. John's College, Cambridge, he served as a volunteer in Holland under Lord Vere of Tilbury, whose daughter Anne he married shortly after his return to England. Although he was knighted in 1640 by Charles I, he declared for the Parliamentary cause and was appointed cavalry general under his father, who commanded the northern Parliamentary forces. He distinguished himself at Marston Moor, July 2, 1644. On the resignation of the Earl of Essex he was appointed commander general of the Parliamentary forces, with Cromwell as lieutenant general. On June 14, 1645, Fairfax, seconded by Cromwell and Ireton, gained a great victory at Naseby. Fairfax was chosen head of the commission which was appointed to try the King, but on discovering that that body was resolved on the execution of the King he refused to serve.

He refused, too, to march against the Scots, who had proclaimed Charles II King, and Cromwell succeeded him as commander in chief. Fairfax retired into private life with a pension of £5000 and devoted his leisure to literary pursuits. After Cromwell's death he represented Yorkshire in Richard Cromwell's first Parliament. He was leader of the delegates appointed to confer with Charles II at The Hague. He spent his last years in retirement at Bilburgh, near York, where he died, Feb. 12, 1671. *Short Memorials of Thomas, Lord Fairfax* (1699), a record of the Civil War, is the most important of his writings, which included theological, poetical, and other compositions. Consult *The Fairfax Correspondence* (4 vols., London, 1848–49), and Markham, *The Great Lord Fairfax* (ib., 1870).

FAIRFAX, THOMAS, sixth BARON FAIRFAX (1692–1782). An American Colonial pioneer, the best known of the Virginia Fairfaxes. He was born in Yorkshire, England. His father, Thomas, by marriage with the daughter of Lord Culpeper, had acquired immense estates in Virginia, comprising about 6,000,000 acres (21 counties), lying mostly between the Potomac and the Rappahannock, and forming almost one-quarter of the entire Colony of Virginia. Thomas, the son, after graduating at Oxford, visited his American estates in 1739, and in 1746, probably after a disappointment in love, left England and settled permanently in Virginia. Thither his younger brother, Sir William, had preceded him a few years earlier, and the latter's daughter Anne had become the wife of Lawrence, the elder brother of George Washington. This connection of the Fairfax and Washington families led to the friendship of Lord Fairfax and George Washington throughout the Revolution. Lord Fairfax employed the young Washington in important surveying work of his own and endeavored to further his interests with the provincial government. Though an ardent Loyalist during the Revolution, he was allowed to dwell in peace in his manor house near Winchester.

FAIR'FIELD. A town and port of entry in Fairfield Co., Conn., 4 miles from Bridgeport and 51 miles northeast of New York City, on the New York, New Haven, and Hartford Railroad, and on Long Island Sound (Map: Connecticut, C 5). A popular summer resort, it has a beautiful situation and one of the finest beaches on the Sound. There are two libraries, the Pequot and the Memorial. The town manufactures rubber goods, aluminum ware, dog biscuit, wire goods, ladies' underwear, and paper. The foreign trade is small. Pop., 1900, 4489; 1910, 6134; 1920, 11,475. Fairfield was settled and incorporated in 1639. Its town hall, originally built in 1720, contains records dating back to 1648. Near Fairfield, in 1637, the Pequot Indians were almost exterminated. On July 6, 1779, Governor Tryon, at the head of a force of Hessians and Tories, entered the town after a sharp skirmish and on the following day almost completely destroyed it by fire. Consult Child, *An Old New England Town* (New York, 1895), and Osgood, *Centennial Commemoration of the Burning of Fairfield* (ib., 1879).

FAIRFIELD. A city and the county seat of Wayne Co., Ill., 117 miles east by south of St. Louis, Mo., on the Southern and the Baltimore and Ohio Southwestern railroads (Map: Illinois, D 5). The city is the centre of a fruit-growing belt, especially noted for apples, and has a trade in grain, live stock, tobacco, etc., and manufactures of underwear, flour, and lumber. The light plant is owned by the city. Pop., 1900, 2338; 1910, 2479.

FAIRFIELD. A city and the county seat of Jefferson Co., Iowa, 100 miles (direct) east-southeast of Des Moines, on the Chicago, Burlington, and Quincy, and the Chicago, Rock Island, and Pacific railroads (Map: Iowa, F 3). Parsons College (Presbyterian), opened in 1875, is situated here, and there are a fine courthouse, county jail, hospital, county home, and a public library. The leading manufactures include agricultural implements, wagons, pumps, washing machines, gloves and mittens, malleable iron, brooms, and tile. Settled in 1839, Fairfield was incorporated in 1847. It is governed, under a charter of 1857, by a mayor, elected every two years, and a unicameral city council. The city owns and operates its water works and electric-light plant. Pop., 1900, 4689; 1910, 4970.

FAIRFIELD. A town in Somerset Co., Me., 21 miles north-northeast of Augusta, on the Maine Central Railroad (Map: Maine, C 4). It contains the Central Maine Sanitarium and a public park. There are lumber, pulp, and crate mills, worsted mills, and manufactories of screens, furniture, swings, and pie plates. Pop., 1900, 3873; 1910, 4435.

FAIR GOD, THE. A story of the conquest of Mexico, by Lew Wallace (1873).

FAIRHAVEN. A town in Bristol Co., Mass., on the Acushnet River, and on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, F 6). It lies opposite New Bedford, with which it is connected by two bridges as well as by ferry and electric railroad. It has a good harbor. The town is a summer resort and contains the Academy of the Sacred Heart, the Millicent Library, and a fine town hall and high-school buildings. There are fishing and shipbuilding interests and manufactures of tacks, nails, iron castings, loom cranks, whaleboats, and oil casks. The government is administered by town meetings. Fairhaven was separated from New Bedford and incorporated as a town in 1812. On Sept. 7, 1778, the militia, commanded by Major Israel Fearing, repulsed a British attack here. Pop., 1900, 3567; 1910, 5122. Consult Ricketson, *The History of New Bedford* (New Bedford, 1858).

FAIR HAVEN. A town in Rutland Co., Vt., 30 miles east of Rutland, on the Delaware and Hudson Railroad (Map: Vermont, A 6). It contains a Carnegie library and manufactories of various slate products. Fair Haven was chartered in 1783 and originally included the present town of West Haven. The water works and sewerage system are owned by the municipality. Pop., 1900, 2999; 1910, 3095.

FÂIR HA'VENS (Gk. Καλοὶ Λιμένες, *Kaloi Limenes*). An anchorage on the south coast of Crete, about 5 miles east of Cape Matala (also called Cape Lithinos or Litino), mentioned in Acts xxvii. 8, in the narrative of Paul's voyage to Rome. After being forced by strong northwest winds to round Cape Salmone (at the eastern extremity of Crete) and run under the lee of the south coast of the island, the ship arrived at Fair Havens. Here a stop of some duration was made, after which, though contrary to Paul's advice and warning, the captain made the attempt to round the cape and reach Phœnix, a more suitable winter harbor some distance to the west. The favoring south wind soon changed to the northeast hurricane Euraquilo, which drove the ship far out into the Mediterranean and finally landed it a wreck on the coast of Malta. Fair Havens is not known to be mentioned in any ancient writing but Acts. The name survives in the locality to this day, however, in its modern Greek form. There was probably no town at the place, but Lasea was near by. The anchorage is small and well protected from westerly winds.

FAIRHEAD, or Benmore Head. A striking promontory of columnar basaltic rock, 636 feet high, on the north coast of Antrim County, Ulster, Ireland (Map: Ireland, E 1).

FAIR HELEN OF KIRKCON'NELL. A ballad of unknown origin. Helen shields her lover from the shot of a rival by throwing herself in front of him, and is killed, while the murderer is slain by the rescued lover. The same story appears in Wordsworth's *Ellen Irwin*.

FAIR'HOLT, Frederick William (1814-66). An English antiquary and illustrator. He was born in London, of German descent; was at first a drawing master, then a scene painter, and finally assistant to the wood engraver Sly. He was employed for several years by the Antiquarian Society and the British Archæological Association of London to make drawings for their publications and edited several works on civic pageantry and other subjects for the Percy Society (1842). All his work as an illustrator is valuable from an archæological standpoint, especially *Costume in England* (1860), the text of which he wrote himself. Other works which he wrote and illustrated are: *Tobacco: Its History and Associations* (1859); *Dictionary of Terms Used in Art* (1854); *Up the Nile* (1862). He supplied the designs for Charles Knight's *Shakespeare*, and other publications, Halliwell's *Life of Shakespeare* (1848), Hall's *Mansions of England* (1843-45), and many other works. His collection of Shakespeareana was left to the town of Stratford, the drawings and notes gathered for his *History of Costume* to the British Museum, and his works on civic pageantry to the Society of Antiquaries, of which he was a member.

FAIR ISLE. An isolated island, lying about halfway between the Orkney and Shetland islands, about 30 miles from either group and 24 miles southwest of Sumburgh Head (Map: Scotland, F 1). Area, 6 square miles. Its coast is practically inaccessible, except at North Haven, on the east coast. The population numbers about 200 inhabitants, who are engaged in sheep raising and fishing; the word "fair" is a derivative of the Norse *faar*, meaning a sheep. The flagship of the Duke of Medina Sidonia, the Admiral of the Spanish Armada, was wrecked at Stromceiler Creek in 1588, and 200 Spaniards escaped to the island. These survivors are believed to have taught the natives the art of knitting, which survives and is exemplified to-day in the making of colored hose in Moorish patterns. There are lighthouses and fog signals on the southwest and northeast extremities of the island.

FAIRLIE, fâr'li, John Archibald (1872-). An American economist. He was born in Glasgow, Scotland, but early removed to this country. He graduated from Harvard University in 1895, studied at Columbia, served for one year as secretary of the commission on canals of New York, was assistant professor and junior professor at the University of Michigan (1900-09), and associate professor of political science (1909-11) and professor (thereafter) at the University of Illinois. He was a member of the Michigan Constitutional Convention in 1907-08 and also served as special agent of the United States Bureau of Corporations in 1908 and 1909. He became associate editor of the *National Municipal Review*. Besides articles in technical journals, he is author of *Municipal Administration* (1901); *National Administration of the United States* (1905); *Local Government in Counties, Towns, and Villages* (1906); *Essays in Municipal Administration* (1908); *Taxation and Revenue System of Illinois* (1910); *Commission Government in Illinois Cities* (1911); *The President's Cabinet* (1913); *Town and County Government in Illinois* (1913).

FAIR MAID. A fish; a local name in Virginia for the scup (q.v.).

FAIR MAID OF KENT, The. Joan, daughter of Edmund Plantagenet, Earl of Kent. Her third husband was Edward, the Black Prince, her second cousin, by whom she became the mother of Richard II.

FAIR MAID OF NORWAY. Margaret, daughter of Eric II of Norway, and of Margaret, daughter of Alexander III of Scotland. Although a woman and of foreign birth, she was recognized as Alexander's successor, but died in 1290, while on her way to Scotland.

FAIR MAID OF PERTH, The. A novel by Sir Walter Scott (1828). The name is applied to the heroine of the story, Catharine Glover.

FAIR MAID OF THE EXCHANGE, The. A drama by Thomas Heywood (1607).

FAIRMONT. A city, summer resort, and the county seat of Martin Co., Minn., 68 miles south-southwest of Mankato, on the Chicago, Milwaukee, and St. Paul and the Chicago and Northwestern railroads (Map: Minnesota, C 7). It has a Carnegie library. Its industries include flour mills, gasoline-engine plant, brick and tile works, a cigar factory, and packing and produce houses. First settled in 1855, it is governed, under a charter of 1904, by a mayor, chosen biennially, and a unicameral council. It owns and operates its water works and electric-light plant. Pop., 1900, 3040; 1910, 2958.

FAIRMONT. A city and the county seat of Marion Co., W. Va., 77 miles southwest of Wheeling, at the head of navigation and on both sides of the Monongahela River, and on the New York Central, the Monongahela Valley, and the Baltimore and Ohio railroads (Map: West Virginia, D 2). The opposite sections of the city are connected by a steel bridge. Fairmont has a State normal school, the Cook Hospital and Training School for nurses, fine high-school and courthouse buildings, and a miners' hospital (State). It is an important coal-mining centre and carries on a large trade in glass products. Its manufactures include flouring mills, planing mills, foundries and machine shops, glass works, cigar factories, etc. Fairmont adopted the commission form of government in 1914. The water works are owned by the municipality. Pop., 1900, 5655; 1910, 9711; 1914 (U. S. est.), 11,439; 1920, 17,851.

FAIR'MOUNT. A town in Grant Co., Ind., 59 miles north-northeast of Indianapolis, on the Cleveland, Cincinnati, Chicago, and St. Louis, and the Pittsburgh, Cincinnati, Chicago, and St. Louis railroads (Map: Indiana, F 4).

It is the seat of Fairmount Academy and the Wesleyan Theological Institute. It has agricultural interests and manufactures of glass bottles, draintile, catchup, and Chili sauce. The town owns and operates its water works. Pop., 1900, 3205; 1910, 2506.

FAIRMOUNT COLLEGE. An institution of learning, situated at Wichita, Kans. The college was first organized in 1892 as a coeducational preparatory school, with the assistance of the Boston Education Society. In 1895 a collegiate department was added, and in 1896 the name of the institution was changed to Fairmount College. It offers courses leading to the B.A. and the corresponding M.A. degrees. The abolishment of the preparatory school was begun in 1912–13, dropping one year at a time. The college will have, after 1915–16, a sub-Freshman department. In 1914 the college had an attendance of 325, of whom 168 were in the college proper. In connection with the college there is a conservatory of music. The library numbers about 28,000 volumes, besides pamphlets. The dean is Arthur J. Hoare.

FAIRMOUNT PARK. See PHILADELPHIA.

FAIR OAKS, BATTLE OF. See SEVEN PINES, BATTLE OF.

FAIR PENITENT, THE. A tragedy by Nicholas Rowe (1703).

FAIR'PORT. A village in Monroe Co., N. Y., 10 miles east of Rochester, on the New York Central and Hudson River and the West Shore railroads (Map: New York, C 4). It is in a fruit-growing and farming district. The manufacture of cans is its chief industry. Pop., 1900, 2489; 1910, 3112.

FAIR ROSAMOND, rŏz'ȧ-mŭnd. The name commonly applied to a daughter of Lord Clifford. She was the acknowledged mistress of Henry II and was said to have been kept by him in a bower at Woodstock, accessible only by a labyrinthine approach, which the King followed by means of a silk thread. According to the popular account, she was discovered and poisoned by Queen Eleanor (about 1173).

FAIR SIDEA, THE. A play by Jakob Ayrer, which Tieck considered to be the source from which Shakespeare drew *The Tempest*.

FAIRVILLE. A village in St. John Co., New Brunswick, Canada, situated on the Canadian Pacific Railway (Map: New Brunswick, C 3). It is connected by electric railway with St. John. It contains a hospital for nervous diseases, and its manufacturing industries include saw and pulp mills, box factories, brickyards, a brush and woodenware factory, and a brewery. Pop., 1914 (municipal est.), 3500.

FAIR'Y. An imaginary creature of small size, conceived according to popular superstition as dwelling in a region called Fairyland and as having a special interest in the affairs of man. The term "fairy," however, is also loosely used to include other beings of a similar character, like the brownie, banshee, elf, fay, gnome, goblin, kobold, nixie, nymph, pixy, puck, salamander, sprite, sylph, troll, and undine. The *jinn*, *djinn*, or *jinnee* are of Oriental origin, the last of which in the corrupt form *genie* is especially associated with the *Arabian Nights*. The character of fairies as portrayed in literature may best be understood by mentioning such typical examples as Shakespeare's *Midsummer Night's Dream*, Spenser's *Faerie Queene*, Milton's earlier poems, Grimm's *Märchen*, and the fairy lore of the Irish tales. Towards mankind fairies are commonly regarded as being beneficent in the main, though sensitive, whimsical, capricious, and often prankish; so that they need to be placated and spoken well of, as in Ireland, where they are termed "the good people." But bad fairies also exist, and their influence upon children plays a prominent part in the stories devoted to fairy lore. The imagination of the folk not only conceives of fairyland as a distinct domain, but it peoples hills, valleys, rocks, streams, and trees with fairy inhabitants, or sees fairy footprints, fairy rings, fairy tables, or fairy horses in natural objects and in natural phenomena.

Belief in fairies forms a phase of early folk thought, and it has partly a realistic basis, as in ancient India, e.g., where popular superstition transformed a lower race of inhabitants like the Nagas into serpent men and serpent women dwelling in enchanted regions beneath the earth. Fairy lore contains likewise certain elements of ancestor worship, of mythology, and of older religious beliefs which advancing knowledge looked upon as antiquated and relegated to the domain of the supernatural. The tendency of the folk to perpetuate the lore of the unseen world is very strong, and it is interesting to notice the changes in its attitude as culture progresses. A study of fairy stories is especially instructive in this regard. Extensive collections of these tales among many different peoples have been made through the influence of folklorists, and scholars have secured valuable results in this interesting field of research.

It is worth adding that the etymology of the word *fairy* has been a subject of some discussion. The suggestion to connect it with the Persian word *peri* is even older than Sir Walter Scott's *Essay on the Fairy Superstition;* but the Old French *faerie*, *faierie*, like our word *fay*, which is from OF. *fae*, Fr. *fée*, Ital. *fata*, Prov. *fada*, Span. *hada*, Lat. *fatare*, enchant, Lat. *fatum*, fate, points to a Romance origin for this term. To associate the word with the English adjective *fair* (AS. *fæger*) would be merely a popular etymology.

Bibliography. MacRitchie, *The Testimony of Tradition* (London, 1891); Jacobs, *English Fairy Tales* (3d ed., London, 1910); id., *Celtic Fairy Tales* (New York, 1910); id., *Indian Fairy Tales* (London, 1892); Grimm, *Deutsche Mythologie* (Berlin, 1875–98); Keightley, *The Fairy Mythology* (London, 1850); Hartland, *The Science of Fairy Tales* (ib., 1891); Ludwig, *Sibirische Märchen* (Glogau, 1890); Chodzko, *Fairy Tales of the Slav Peasants and Herdsmen* (trans. from French by Harding, London, 1896); Weber, *Italienische Märchen in Toscana aus Volksmund gesammelt* (1900); Riklin, *Wunscherfüllung und Symbolik im Märchen* (Vienna, 1908); Aarne, *Vergleichende Märchenforschungen* (Helsingfors, 1908); Benz, *Märchen-Dichtung der Romantiker, mit einer Vorgeschichte* (Gotha, 1908); Friedrichs, *Grundlage, Entstehung und genaue Einzeldeutung der bekantesten germanischen Märchen, Mythen, und Sagen* (Leipzig, 1909); Delattre, *English Fairy Poetry from the Origins to the Seventeenth Century* (London, 1912); *Journal of American Folk-Lore* (Boston, 1888–). See also FOLKLORE; MYTHOLOGY.

FAIRY QUEEN. See FAERIE QUEENE.

FAIRY RING (because the fairies were supposed to dance there). A spot or circle in a pasture or lawn which is either more bare than the rest of the field or more green and luxuriant.

Frequently a bare ring appears like a footpath, with green grass in the centre, the circle which the ring forms, or of which it might form a part, being some yards in diameter. It is now ascertained that fairy rings result from the centrifugal development of certain kinds of fungi, especially of *Agaricus oreades* (or *Marasmius oreades*), *Agaricus gambosus*, *Agaricus coccineus*, and *Agaricus personatus*. The common mushroom (*Agaricus campestris*) shows a tendency to grow in the same manner. Probably the spot where the agaric has already grown is unfitted for its continued nourishment, and the mycelium or spawn extends outward to new soil, the fungus unfitting the soil to which it extends for the immediate nourishment of grass, but enriching it afterward by its own decay. Fairy rings of large size sometimes occupy the same situation for many years. The circle is almost always imperfect, some accidental circumstance having arrested the growth of the mycelium on one side. For illustration, see Plate of Edible Fungi, under Fungi, Edible and Poisonous.

FAIRY SHRIMP. See Branchiopoda.

FAITH (OF. *feid*, *foit*, *fei*, *foi*, Fr. *foi*, It. *fede*, from Lat. *fides*, faith, from *fidere*, to trust; connected with Gk. *πείθειν*, *peithein*, to persuade, AS. *biddan*, Eng. *bid*). In Jewish and Christian theology, that mental act of man which places him in an acceptable relation to God. In the later Jewish thought, it is a confident clinging to the belief in the power and goodness of Jehovah, in spite of the seeming triumph of evil. It was this faith which the apocalyptic literature aimed to conserve. In the teaching of Jesus, faith is also a belief in the power and goodness of Jehovah. Paul, who frequently uses the word, means belief in the word of God. Since he thinks of the message of God as having come to his generation through Jesus, Christian faith comes to be the acceptance of God's message of a way of salvation through Christ. God gives harmony with Himself, and faith is the acceptance of God's gift; a principle which, he maintained, underlay the Jewish religion itself. The writer of Hebrews broadens faith to mean the vision of the realities of the unseen, spiritual world. In all these meanings, faith includes two elements. One is intellectual. To the Jew it was the belief in the existence and power of Jehovah, to which the Christian added a belief that Jesus was the Messiah sent by Jehovah. This is the kind of faith which underlies our belief in the facts of history, or of science, or of daily life. The other element is volitional, a loving trust in God often issuing in an emotional quality.

As the Christian doctrine became formulated the gathered content of it was called the Christian faith. The intellectual element was emphasized, and faith became the assent to the authoritative body of teaching in the Church. The schoolmen, especially Aquinas (q.v.), distinguished between implicit and explicit faith: the last is conscious of its object; the first was defined by Aquinas as the preparation of the mind to believe what the Scriptures contain. Less careful thought regarded it as the acceptance of the uncomprehended teaching of the Church. This laid the basis for a popular contrast between faith and reason. In fact, faith is based on reason.

The Roman Catholic church has emphasized faith as the acceptance of doctrine, but with an element of love in it. Protestantism has emphasized the personal trust in God, but usually with the demand for the acceptance of certain doctrines, held to be divinely revealed. Consult Harnack, *History of Dogma* (Boston, 1894–99), and Inge, *Faith and its Psychology* (London, 1909).

FAITH, Act of. See Auto da Fé.

FAITH, Rule of. A term, originating in the Church of the second century, used to indicate the sum of Christian doctrine. 1. Many persons, denying either the possibility or the fact of a supernatural revelation, maintain that human reason alone, as possessed by all persons of sound mind, is both the source and ground of all religious knowledge and conviction of duty. 2. Others, either denying or depreciating the authority of any external revelation, affirm that every man, in connection with his reason, has an inward revelation to which pertains the supreme authority in the belief of truth and knowledge of duty. 3. The Roman Catholic church, insisting that truth supernaturally revealed is the rule of faith, teaches that the revelation actually given is partly written (as contained in the Holy Scriptures) and partly unwritten (as contained in the traditions dating from the earliest ages of the Church), and that, consequently, the rule of faith includes both Scripture and tradition. And as the people cannot surely and perfectly understand either of these, the only authorized interpreter of them both is the Church. 4. Protestants believe that all truth necessary for salvation is contained in the canonical Scriptures of the Old and New Testaments, and therefore teach that these (received after due inquiry as the word of God, and interpreted according to man's own judgment, enlightened through the use of all accessible helps, human and divine) constitute for him the rule of faith. Among those holding this general principle of Protestantism there are recognized diversities, according as emphasis is laid on the authority of the Bible, the Church, or the individual reason. See Creeds and Confessions; Rationalism; Infallibility; Bible.

FAITH CURE. A term applied to the practice of curing disease by an appeal to the hope, belief, or expectation of the patient, and without the use of drugs or other material means. Formerly it was confined to methods requiring the exercise of religious faith, such as the "prayer cure" and "divine healing," but has now come to be used in the broader sense, and includes the cures of Mental Science, and hypnotism; also a large part of the cures effected by patent medicines and nostrums, as well as many folk practices and home remedies. By some it is used to include also Christian Science, but the believers in the latter regard it as entirely distinct.

Faith cure, in some of its forms, is as old as human history. The Christian Church has always held that prayer should be offered for the sick, and many sacred relics and favored shrines have had marvelous powers of healing ascribed to them. The Grotto of Lourdes, in France, and the shrine of Ste. Anne de Beaupré, in Quebec, are well-known instances. In each of these places thousands of cures have been wrought, in accordance with the faith of the sufferers in the potency of the blessed waters. These cures seem to many to be the natural consequences of the doctrine taught by the story of the Pool of Bethesda, and various utterances of Jesus and the Apostles are quoted in support of more or less definite teachings and practices of faith healing. About a quarter of a century ago one Dr. Cullis, of Boston, created a sensation by preaching the efficacy of prayer in the cure of bodily ills. More recently two men became prominent from their advocacy of the prayer cure. Rev. A. B. Simpson, of New York, taught that the healing of the body is included in the Atonement, and that, having accepted the Atonement, it is dishonoring God not to claim healing of the body. Simpson followed the apostolic practice and anointed with oil. John Alexander Dowie, of Zion City (see CHRISTIAN CATHOLIC CHURCH), maintained a large establishment on the plan of a hotel, which he called a Divine Healing Home. His method consisted in prayer and the laying on of hands. He reported many cures and accumulated a large sum of money from the voluntary contributions of those who had been healed. Another class of divine healers is the group who have been styled the "tramp healers," from their habit of traveling about the country. The most important person in this class was the unfortunate Schlatter (q.v.), the Denver healer, whose autobiography shows that he was the victim of an insane delusion. Most prominent among those forms of healing covered by the broader use of the term "faith cure" are Christian Science (an account of which will be found in the article on that subject) and Mental Science, of which Dr. P. P. Quimby, of Portland, Me., was the formulator. Mrs. Eddy was a patient of Dr. Quimby, and is believed by some to have derived her "science" from him. This, however, is denied by Christian Scientists. Since Dr. Quimby's death Mental Science has been espoused by a large number of intelligent people, until there are now many variants. There being no organization and no one to dictate what one shall believe or practice, each Mental Scientist is free to put his own individuality into the movement, formulating his own theory and adapting his practice to his own ideas. This has resulted in the development of a large number of leaders and types of mental healing. Their treatment consists in holding up to the patient ideal conditions of health and happiness, and so freeing his mind from the unhappy condition or unpleasant thoughts which are supposed to have caused the physical disease. Sometimes this is done by conversation and sometimes by silent influence. Both Christian Scientists and Mental Scientists give "absent treatments," but the former with the understanding that God heals, while the latter claim that they influence the patient's mind.

Dr. Quimby discovered his theory of Mental Science through experimenting with hypnotism. A boy whom he was in the habit of hypnotizing pretended to diagnose disease while in the hypnotic state, and also prescribed a remedy. Dr. Quimby quickly discovered that the boy always named the disease in accordance with the belief of the patient, and also that the remedy prescribed, although it might be a perfectly inert substance, effected a cure. From this he concluded that it was the faith of the patient that was responsible for the cure. He therefore abandoned hypnotism and proceeded to explain his theory to his patients. When he succeeded in making them understand the doctrine, the cure followed. He had many patients, and is said to have wrought many cures. It did not occur to Dr. Quimby to try hypnosis on the patient, and it has remained for a group of men now living to show the great value of hypnotism in faith cures.

The hypnotist first puts his patient to sleep, in which condition he believes anything that is told him—just as in our ordinary dreams the most absurd situations are accepted without question. The faith of the hypnotized subject is perfect, for the reason that no doubts can possibly enter his mind. The method of treating disease is very simple. Having put the patient to sleep, the hypnotizer persistently assures him that he is getting well or is already well. The exact formula is governed by the character of the disease. In severe or chronic cases he is usually content to declare at the first sitting that there will be improvement, and at future sittings he makes stronger assertions until he finally declares that the trouble is entirely removed and will not return. Hypnotism is the most scientific and the safest form of faith cure. Many people object to it from ignorance of the nature of hypnotism. But when it is understood that it is not the influence of one mind over another, and that one cannot be hypnotized against his will, this form of faith cure will take its place as one of the regular methods of combating disease.

Besides these recognized forms, faith cure is an important element in cures wrought by patent medicines and nostrums, home remedies and folk practices. The advertisement, testimonial of friend, or family tradition arouses the faith of the sick man, and he comes to believe that he needs only to follow directions to be fully cured. The actual value of faith cure as a therapeutic method has been the subject of much discussion. It can no longer be denied that it has value. From divine healing to patent medicine and Father Kneipp's (see KNEIPP) water cure, all cure disease. Each appeals to a particular type of mind, but the results are practically the same in all—same diseases cured, same successes, same failures. Many faith curists claim that all diseases in all persons can be cured by their method; others hold that the principle is of limited application. Of them all, the hypnotists are the only ones that do not make sweeping claims.

In estimating these claims many things must be considered. It has never been proved that any disease which is incurable by ordinary methods has been cured by faith. Many claims are made, but it is impossible to prove them. The difficulties are well-nigh insurmountable. First is the matter of diagnosis. No physician can be sure of his diagnosis in all cases. A man is sick; death proves that he was suffering from cancer; recovery shows that it was a nonmalignant tumor. In consumption the only infallible test is a microscopic examination. Next to diagnosis must be considered what is called *medicatrix naturæ*—the healing power of nature or the natural tendency to recovery. Scientific studies of this subject have shown that the lists of faith cures contain a large percentage of cases that would have recovered without any treatment. Thirdly, the cure must be proved as well as the disease. Many a recovery is announced which proves to be only a temporary renewal of strength. When later the patient relapses, this is either not mentioned or is attributed to another cause. In addition to these difficulties, and complicating them, is the notorious untrustworthiness of human testimony—the tendency to exaggeration and the infrequency of impartial judgment.

The actual cures, however, are sufficiently numerous and sufficiently striking to need an explanation. These different forms agree in only one point—viz., the mental state of the patient is one of hope and expectation. Can states of mind cause or cure disease? Some familiar occurrences seem to justify an affirmative answer. It is well known that certain glands and secretions are markedly affected by emotions. Fright causes the saliva to cease to flow and the perspiration to start. Sorrow causes the lachrymal glands to secrete tears. Happiness favors digestion, unhappiness retards it. Mosso has demonstrated that the bladder is especially sensitive to emotional states. In general, pleasant and unpleasant emotions produce opposite physical effects. There are many glands within the body whose action under emotion we cannot observe; but we may reasonably assume that they also are affected by emotional states. Hence, if unpleasant emotions so act upon the glands as to derange the system and cause disease, the pleasant emotions may reasonably be assumed to tend to restore the normal functions. The various forms of faith cure tend strongly to put the patient in a happy frame of mind—a condition favorable to health. However, there are all degrees of faith and wide differences in the way the system responds to the emotional state. One person is slightly affected by a strong emotion; another is strongly affected by a weak emotion. Hence there must always be a wide difference in the results of faith-cure methods. The diseases most amenable to faith cure are nervous—including many not recognized as nervous, but having a neural condition as their basis—and functional derangements. The symptoms of organic diseases are frequently ameliorated. Chronic diseases due to neuromuscular habit often yield to hypnotic treatment. Consult: Pease, *Divine Power* (New York, 1905); Podmore, *Mesmerism and Christian Science* (London, 1909); Lawrence, *Primitive Psychotherapy and Quackery* (New York, 1910); Cutten, *Three Thousand Years of Mental Healing* (ib., 1911). See Hypnotism.

FAITH′FUL. An allegorical character in Bunyan's *Pilgrim's Progress*.

FAITH′FULL, Emily (1835–95). An English philanthropist. She was born at Headley Rectory, Surrey, and was educated at Kensington. Becoming interested in the condition of working women, she founded in London a printing establishment, known as the Victoria Press (1860), in which women were employed as compositors. The undertaking met with great opposition, but the Queen showed her approval by appointing Miss Faithfull publisher in ordinary to her Majesty. In 1863 she started the *Victoria Magazine*, in which were set forth the claims of women to remunerative employment. In 1868 she published a novel, entitled *Change Upon Change*. She also appeared as a lecturer, visiting the United States in 1872–73 and 1882. She died May 31, 1895. Consult *Three Visits to America* (Edinburgh, 1884).

FAITHFUL SHEPHERDESS, The. A pastoral drama by John Fletcher (c.1610). From it Milton drew for parts of his *Comus*.

FAIT′HORNE, William (1616–91). An English line engraver and painter. He was born in London and studied principally under Sir Robert Peake. During the Civil War he took the part of the monarchy and was banished to France, where he remained until 1650. While in Paris he studied under Robert Nanteuil. On his return to England in 1650 he practiced as an engraver, also selling prints. From about 1680 he devoted himself to portraiture in crayons. His engravings are chiefly portraits of eminent persons, after Lely, Van Dyck, and others. His execution is clear and finished and his crayon portraits are distinguished by brilliant color. Among the best known of his engravings are the portraits of Lord Paston; The Duchess of Cleveland (after Lely); Lady Paston (after Van Dyck); Charles I; Charles II; Prince Rupert; and Oliver Cromwell. He also engraved two curious maps, one of London (in the National Library, Paris), and one of Virginia and Maryland (in the British Museum). His works were catalogued by Louis Fagan (London, 1888). Faithorne wrote *The Art of Graveing and Etching* (1662), dedicated to his master, Sir Robert Peake. Consult Fagan, *A Descriptive Catalogue of the Works of William Faithorne* (London, 1888).

FAIZABAD. See Fyzabad.

FAIZABAD, fī′zȧ-bäd′. The capital of the Afghan Province of Badakhshan, on the Kokcha River, 180 miles northeast of Kabul (Map: Afghanistan, O 4). It has a fort, is a trade centre, and is celebrated for its ruby mines. Pop., about 2500.

FAJARDO, fȧ-ʜär′dō. A river port near the northeast coast of Porto Rico, near the mouth of the Fajardo River. Its growth has been rapid on account of its excellent harbor. It is situated in a sugar-manufacturing district and exports tortoise shell in considerable quantities, besides sugar and molasses. Pop., 1899, 3414; 1910, 6086.

FAKHR-AD-DIN AR-RAZI, făk′r-ȧd-dēn′ är-rä′zē, also known as Ibn al Khatin (1149–1209). A Mohammedan philosopher and theologian. He was born at Rai, Tabaristan, and first studied with his father and later at Merv and Maragha, where he was one of the pupils of Al Majd al Jili, who in turn had been a disciple of Al Ghazali. He was accused of rationalism, despite the fact that he restored many to the orthodox faith. His commentary on the Koran, entitled *Mafatih-al-haib*, or 'Keys of the Unseen' (8 vols., Cairo, 1890), is the most varied of extant works of the kind, comprising most of the material of importance that had previously appeared. It has some mysticism, opposes anthropomorphism, and in general carries on the teachings of Al Ashari. Fakhr-ad-din devoted himself to a wide range of studies and expended a large fortune on experiments in alchemy. He taught at Rai and Ghazni, and became head of the university founded by Mohammed Ibn Tukush at Herat.

FAKIR, fȧ-kēr′ (Ar. *faqīr*, beggar, religious mendicant, from *faqura*, to be poor). In general, a religious mendicant; more specifically, a Hindu marvel worker or priestly juggler, usually peripatetic and indigent. The fakir may be regarded as a differentiated shaman or sorcerer, standing midway between the best and the worst products of the original class—i.e., between priest and beggar. There are, however, many classes, defined chiefly by cult, but also by race, school, or particular craft. In Mohammedan countries fakirs are usually divided into two classes—the orthodox, or those "within the law," and the heterodox, or those "without the law." In portions of India, also, there is a particularly orthodox or elevated class, known as yogis, with a much larger irregular or outlaw class; and in some sections the fakirs grade into dervishes, some of whom engage in religious rites or invocations involving peculiar postures or movements, such as spinning on the toes with outstretched arms for hours at a time. The Hindu fakirs are probably the most expert jugglers in the world, and many of their feats have puzzled the most acute Western students—some have never been fully explained. They appear to be adepts in sleight of hand, in hypnotism, in ventriloquism, in producing illusions, and in controlling organic reactions by voluntary effort, and many of the current devices of jugglery in other parts of the world have been borrowed from them. The parallelism between the Hindu fakir and the Amerind shaman is particularly close, as in the mango trick of the one and the corn trick of the other. In both cases the plant is apparently grown in sight of the spectators, in a few minutes, from the seed, through the tender shoot, the forming bud, the full bloom, the immature fruit, and the ripened product, all by an ingenious series of illusions: but the Oriental trick has become little more than a feat of jugglery; the Occidental one remains a part of a solemn religious ceremony. See MAN, SCIENCE OF, section *Sophiology.*

FAKUMEN, fä′kōō-mŭn′. A town of southern Manchuria about 40 miles north of Mukden and 20 miles west of Tie Pass. It was occupied by the Japanese, March 18, 1905, after the battle of Mukden.

FALAISE, fȧ′lâz′. The capital of an arrondissement in the Department of Calvados, France, on the Ante, 19 miles southeast of Caen (Map: France, E 4). It is built on a cliff, whence its name. The chief buildings are the two Gothic churches, La Trinité and Saint-Gervais, the hospital, and the ruined castle and fortress, once the seat of the dukes of Normandy, and the birthplace of William the Conqueror, a statue of whom stands on the Place Saint-Gervais. In the castle, the chamber in which the Conqueror was born is shown. Educational institutions include a college and a library. Falaise manufactures cottons, hosiery, bobbinet, dyestuffs, chimes, and leather. An annual fair, dating from the eleventh century, is held each August at Guibray, a suburb. Pop. (commune), 1901, 7657; 1911, 6847. Consult Dodd, *Falaise, the Town of the Conqueror* (Boston, 1900).

FALANAKA, fä′lȧ-nä′kȧ (Malagasy word). A peculiar fossorial civet (*Eupleres goudotii*) of Madagascar, remarkable for its slender skull, the weakness of its jaws, and the small size of the teeth, which are insectivore-like and, with other characteristics, make this animal the most aberrant of the Viverridæ. Accordingly it is placed in a subfamily (Euplerinæ) by itself.

FALASHAS, fȧ-lä′shȧz (Ethiop., wanderers). The inhabitants of the Abyssinian Kingdom of Amhara. They claim to be of Jewish race and to be descended from emigrants of the period of disorder in Israel during and following the reign of Jeroboam. Whether they are true Jews, or descendants merely of proselytes of the period of close connection between Abyssinia and Israel, is uncertain. They practice debased Jewish rites, are not acquainted with the Babylonian or Jerusalem Talmud, make no use of the *tephillin*, and observe neither the Feast of Purim nor that of the Dedication of the Temple. They possess, in Geez, an Ethiopic dialect of great antiquity, the foundation of the Amharic, the canonical and apocryphal books of the Old Testament; a volume of extracts from the Pentateuch, with comments, given as they think, from God to Moses on Mount Sinai; the Te-e-sa-sa Sanbat, or laws of the Sabbath; the Ardit, a book of secrets revealed to twelve saints, which is used as a charm against disease; lives of Abraham, Moses, etc., and a translation of Josephus, called Sana Aihud. A copy of the Orit, or Mosaic law, is kept in the holy of holies in every synagogue. Various pagan observances are mingled in their ritual; every newly built house is considered uninhabitable till the blood of a sheep or fowl has been spilt in it; a woman guilty of a breach of chastity has to undergo purification by leaping into a flaming fire; the Sabbath has been deified and, as the goddess Sanbat, receives adoration and sacrifice, and is said to have ten thousand times ten thousand angels to wait on her commands. There is a monastic system, said to have been introduced in the fourth century. The monks must prepare all their food with their own hands, and no lay person, male or female, may enter their houses. Celibacy is not practiced by the priests, but they are not allowed to marry a second time, and no one is admitted into the order who has eaten with a Christian or is the son or grandson of a man thus contaminated. Belief in the evil eye or shadow is universal, and spirit raisers, soothsayers, and rain doctors are in repute.

Education is in the hands of the monks and priests, and is given only to boys. Fasts, obligatory on all above seven years of age, are held on every Monday or Thursday, on every new moon, and at the Passover (the 21st or 22d of April). The annual festivals are the Passover, the Harvest Feast, the Baala Mazâlat or Feast of the Tabernacles (during which, however, no booths are built), the Day of Covenant or Assembly, and Abraham's Day. It is believed that after death the soul remains in a place of darkness till the third day, when the first *taskar*, or sacrifice for the dead, is offered; prayers are read in the *mesgeed* (synagogue) for the repose of the departed, and for seven days a formal lament takes place every morning in his house. No coffins are used, and a stone vault is built over the corpse so that it may not come into direct contact with the earth. The Falashas are an industrious people, living for the most part in their own villages or, if they settle in a Christian or Mohammedan town, occupying a separate quarter. They engage in agriculture, manufacture pottery, ironware, and cloth, and are especially sought after for their skill in masonwork. Their number is variously estimated at from 100,000 to 250,000. Consult: Flad, *The Falashas of Abyssinia* (Eng. trans., London, 1869); Stern, *Wanderings among the Falashas in Abyssinia* (London, 1862); Halévy, *Travels in Abyssinia* (Eng. trans., London, 1878). M. Halévy was a Jew, sent to Abyssinia to offset the effects of Christian missionary work. Consult also: Morais, "The Falashas," in *Pennsylvania Monthly* (Philadelphia, 1880); Cyrus Adler, "Bibliography of the Falashas," in *American Hebrew* (New York, 1894); Lewin, "Ein verlassener

Bruderstamm," in *Bloch's Wochenschrift* (February, 1902); J. Faitlovitch, *Notes d'un voyage chez les Falachas* (Paris, 1905).

FALB, fälp, RUDOLF (1838-1903). An Austrian meteorologist, born at Obdach, Styria. He studied theology at Gratz, and although ordained to the priesthood, subsequently became converted to Protestantism. From 1869 to 1872 he studied mathematics, physics, geology, and astronomy at Prague and Vienna, and from 1877 to 1880 he traveled through North and South America. Subsequently he became established at Berlin. He was widely known by his theory that the influence of the sun and moon, exercised conjointly on the atmosphere and on the molten material beneath the earth's surface, produces earthquakes and other disturbances of nature. This theory has, however, found no acceptance among scientists. He was popularly known for his predictions of "critical days." In 1868 he founded the popular astronomical periodical *Sirius* (conducted from 1882 by Klein). His works include: *Von den Umwälzungen im Weltall* (3d ed., 1890); *Das Wetter und der Mond* (2d ed., 1892); *Kalender der kritischen Tage* (1892 et seq.).

FALCK, fälk, NIELS NIKOLAUS (1784-1850). A German jurist, born at Emmerlef, Schleswig, and educated at Kiel. In 1814 he became professor of law at Kiel, and in 1838 was appointed President of the Schleswig-Holstein Assembly of the States, but lost the support of the Liberals by his vacillating policy. He published a *Juristische Encyklopädie* (5th ed., 1851) and was a prolific author in the history and jurisprudence of Schleswig-Holstein. His works include *Handbuch des schleswig-holsteinischen Privatrechts* (1825-48) and *Sammlungen zur nähern Kunde des Vaterlandes* (1819-25). He also edited the *Staatsbürgerliches Magazin* (10 vols., 1821-31; continued as *Neues Staatsbürgerliches Magazin*, 10 vols., 1833-41).

FALCKENSTEIN, fälk'en-stīn, EDUARD VOGEL VON. See VOGEL VON FALCKENSTEIN, EDUARD.

FALCON, fô'k'n (OF. *faucon*, *falcon*, It. *falcone*, from Lat. *falco*, falcon, from *falx*, sickle). Broadly, any hawk of the family Falconidæ, more usually and scientifically one of those species which, in the language of falconry, were styled "noble" birds of prey. The true falcons are characterized by a bill curved from the base, the upper mandible hooked at the point, and the cutting edge of the upper mandible furnished with a prominent projection or "tooth." The claws are also sharp, curved, and strong; and in accordance with all this powerful armature the whole frame is very robust and muscular. The legs are rather short and have great power in striking or seizing prey. The breastbone and shoulder girdle are large and adapted for the attachment of powerful muscles; the wings are long and pointed. The true falcons are bolder in proportion to their size than any other of the Falconidæ, even the eagles. Their acuteness of vision is wonderful, and they have very great powers of flight. A falcon is recorded as having traversed the distance between Fontainebleau and Malta, not less than 1350 miles, in 24 hours. They soar to a prodigious height in the air, always endeavoring to outsoar any bird of which they may be in pursuit and to swoop down upon it from above; although it is far more difficult for them to rise vertically in a calm atmosphere than for birds of short and rounded wing, and they either rise obliquely—often making their onward flight in a series of arcs—or avail themselves of the wind, and by flying against it are borne aloft as a boy's kite is.

The species are numerous and widely distributed. Some of them are of very wide range, while others are peculiar to certain countries or climates. The best-known American species are the gyrfalcon (q.v.), formerly confused with the Iceland falcon and the Greenland falcon, and the peregrine falcon, known in the United States as duck hawk, of which the female is par excellence "the falcon of falconers" and the male is the "tercel," "tiercel," or "tercelet." The hobby (*Falco subbuteo*); the red-footed or red-legged falcon (*Falco rufipes* or *vespertinus*), a small species, much resembling the hobby; the merlin (*Falco æsalon* or *regulus*) and the kestrel or windhover (*Falco tinnunculus*) are common and well-known English species. The gyrfalcon and peregrine are European also. The name "falcon" is sometimes extended to cover all of the various birds included in the Falconidæ, some 350 species, of which about one-tenth occur in the United States. The birds commonly called buzzards, eagles, kites, hawks, harriers, ospreys, and caracaras (qq.v.) are usually included in that family, but it is obviously confusing to call them all falcons, and the word is better restricted therefore to the genus *Falco*, in its present restricted sense.

For the use of falcons in sport, see FALCONRY; for books relating to the family, see BIRDS, and consult Fisher, *Hawks and Owls of the United States* (Washington, 1893); and for portraits, see Plates of EAGLES AND HAWKS, and FALCONS AND FALCONRY.

FALCON. A small mediæval gun. Falcons were generally long (20 to 30 calibres) and light. While some are said to have been of sufficient size to throw shot of six pounds' weight, the majority were much smaller. In the sixteenth century Henry II of France decreed that the *falcon* should fire a ball of one pound weight, and that the *falconet* should use one weighing one-half pound. See ARTILLERY.

FALCÓN, fäl-kōn'. A maritime state of Venezuela, occupying the territory around Lake Maracaibo in the northwestern part of the Republic (Map: Venezuela, C 1). From 1881 to 1904 it was joined to Zulia, which is now a separate state. It is traversed by a chain of low mountains, and the soil in the valleys is very fruitful, though the coast regions are dry and barren. The chief products are coffee, cacao, corn, cotton, sugar cane, coconuts, fruits, and tobacco. Stock raising is of importance, and the state has some mineral wealth. Pop., 1891, 151,692; 1909, 139,110. Coro is the capital.

FALCÓN, fäl-kōn', JUAN CRISÓSTOMO (1820-70). A Venezuelan soldier and politician, born on the Peninsula of Paraguaná (State of Falcón, then Province of Coro). After a brilliant military career he became, in 1858, the leader of the Federalist revolutionary movement in Coro, and in 1863 entered Carácas in triumph, after being elected President of Venezuela. He sanctioned the promulgation of a new constitution in 1864. Overthrown in a revolutionary riot three years later, he withdrew to Europe, whence, upon the success of a counter-revolution, he was summoned again to assume office. He died on the return voyage, at the island of Martinique.

FALCONE, fäl-kō'nā, ANIELLE (ANGELO) (1600-65). An Italian battle painter, born in Naples. He was a pupil of Jusepe de Ribera (q.v.) and himself founded a large school. His work being mostly confined to battle pieces, he was called "L'oracolo delle battaglie." At the outbreak of the revolt of the Neapolitans under Masaniello against Spain, he organized his pupils into the "Compagnia della morte," which never spared a Spaniard. After the suppression of the revolt he was forced to flee to Rome. Proceeding to France, he was eminently successful there, numbering Louis XIV among his patrons. Under the protection of Colbert he returned to Naples, where he died in 1665. His paintings, of which not many survive, are full of life and animation, are brilliant in color, and careful in drawing. As he seldom signed them, they are sometimes confounded with those of his pupil Salvator Rosa, who also studied under Ribera. The Prado (Madrid) possesses two of his battle pieces, the Louvre one, and the Museum of Naples two. He was also an important etcher, in command of a bold and spirited technique.

FALCONER, fa̤'k'nẽr, EDMUND (1814-79). The assumed name of Edmund O'Rourke, an English actor and playwright. He was born in Dublin, Ireland, first performed on the English provincial stage, and afterward went to London, becoming manager of the Lyceum Theatre (1858 and again in 1861) and of Drury Lane (1862-66). He wrote for other theatres and was in the United States for three years (1867-69), connected with the Olympic Theatre in New York. Returning to England, he died Sept. 29, 1879. He composed or adapted many plays. *The Cagot* was performed at the Lyceum, London, in 1856. The most popular of his dramas was *Peep o' Day* (1861), founded on one of Banim's stories of Irish life. As an actor he was admirable in Irish rôles.

FALCONER, HUGH (1808-65). A Scottish botanist and paleontologist, born at Forres (Elginshire). He graduated at the University of Aberdeen in 1826, studied medicine at the University of Edinburgh in 1826-29, went to India in 1830 as assistant surgeon in the service of the East India Company, and in 1832 became superintendent of the botanic garden at Saharanpur (Northwestern Provinces), India. His investigations led to the discovery in the Sivâlik Hills of large numbers of important vertebrate fossils. For his work in connection with these remains he obtained the Wollaston medal of the Geological Society of London in 1837. It was on his recommendation, in a report to the government of Bengal, that the culture of the tea plant was introduced into India. He also discovered the asafœtida plant, and was the first to give a description of it. During his residence in England on sick leave in 1843-47 he prepared the India fossils of the British Museum for exhibition. In 1847 he received appointment as superintendent of the Calcutta Botanic Garden, and professor of botany in the medical college there. Because of ill health he returned to England in 1855 and spent the remainder of his life examining fossil species there and on the Continent. He was elected foreign secretary of the Geological Society and a vice president of the Royal Society. He edited a large incomplete work entitled *Fauna Antiqua Sivalensis* (1846-49; nine parts, with illustrations of 1123 specimens, and one volume of text) and published a *Descriptive Catalogue of the Fossil Remains from the Sewalik Hills* (1859). Considerable unpublished material was edited by C. Murchison as *Palæontological Memoirs and Notes of the Late Hugh Falconer* (London, 1868). Consult the biographical notice in the first volume of that work, and the *Royal Society's Catalogue of Scientific Papers*, vol. ii (London, 1868).

FALCONER, ROBERT ALEXANDER (1867-). A Canadian clergyman and educator. He was born at Charlottetown, Prince Edward Island, and was educated at Queen's Royal College, Trinidad, and at London and Edinburgh universities. Later he also studied at German universities. He was ordained a Presbyterian minister in 1892. In 1892-95 he was lecturer in, and in 1895-1904 professor of, New Testament exegesis in the Presbyterian College, Halifax; and in 1904-07 he was principal of the college. In 1907 he became president of Toronto University. In the same year he was appointed a member of the joint committee to promote church union between the Presbyterian, Methodist, and Congregational churches in Canada. He contributed numerous articles on theological and biblical subjects to encyclopædias and to British and American periodicals. He published *The Truth of the Apostolic Gospel* (1904), besides a number of educational lectures and addresses. In 1911 he was created C.M.G.

FALCONER, WILLIAM (1732-69). An English poet, son of a poor barber. He was born in Edinburgh. Becoming a servant, he found in Archibald Campbell a master who encouraged his literary tastes. He went early to sea, and before he was 18 years of age he was second mate on a vessel in the Levant trade, which was shipwrecked off Cape Colonna in Greece. Of the crew only he and two others were saved. The story of this voyage he related in a poem called "The Shipwreck" (1762). Entering the royal navy, he was appointed purser on the frigate *Aurora*, which was about to sail for India. The *Aurora*, after touching at the Cape of Good Hope, December, 1769, was lost. All the crew perished. "The Shipwreck" passed through three editions before this tragic event, and is still an interesting poem. Falconer wrote a political satire entitled *The Demagogue* (1764) and compiled a nautical dictionary, *The Universal Marine Dictionary* (1769). His *Poetical Works* were edited, with a *Life*, by Gilfillan (London, 1854).

FALCONET, fäl'kō'nā', ETIENNE MAURICE (1716-91). A French sculptor. He was born in Paris and studied with Nicolas Guillaume and Lemoyne. His first important work—the vigorous "Milo of Crotona" (Louvre)—secured his admission to the Academy (1744), in which he became professor in 1761 and associate rector in 1783. In 1757 he was appointed director of sculpture at the Sèvres factory. He was employed by the Marquis de Pompadour and also modeled a number of important statues for the church of Saint-Roche, including one of "Christ in Agony." In 1766 Catharine II of Russia summoned him to model a bronze equestrian statue of Peter the Great at St. Petersburg—his masterpiece. Although the statue required 12 years to model and cast, it possesses little originality and is remarkable chiefly for the exaggerated position o' the horse. After his return to France in 1781 he devoted himself principally to writing. His literary works, mostly concerned with his own art, were published as *Œuvres* *complètes d'Etienne Falconet* (Lausanne, 1785). Falconet is one of the most important sculptors of the eighteenth century in France. He shows to best advantage in such graceful statues as "Winter," "Pygmalion" (one of his most delicate and personal works), "The Three Graces," "The Bather" (both in the Louvre), "Venus and Love" (Wallace Collection, London), and "Music." His modeling is correct and skillful, but his work is somewhat affected in sentiment.

FALCONETTO, fäl′kō-nĕt′tō, Giovanni Maria (1458–1534). A Veronese architect and painter of the Renaissance. He studied under his father, Jacopo Falconetto, and probably under Melozzo da Forlì, but was by preference an architect. His chief works in painting were frescoes in the chapel of San Biagio, church of San Nazaro (1493), the Duomo (1503), and the church of San Pietro Martire in Verona—the latter a series of religious allegories somewhat in the manner of his master. His easel pictures, such as "Augustus and the Sibyl," in the Verona Gallery, are weak and exaggerated. More important are his architectural works at Padua, where he designed and built the fine Renaissance Palazzo Giustiniani (1524) and other structures, including several of the city gates.

ANCIENT FALCONRY.
(From an old manuscript in the British Museum.)

FALCONIFORMES, fäl′kon-ĭ-fôr′mēz. An ordinal term, used by Evans and some recent ornithologists, for the raptorial birds, including (1) the Cathartidæ and (2) the Accipitres, the latter embracing (*a*) the Falconinæ and (*b*) the Pandioninæ. It is usually replaced by the ordinal term Accipitriformes, while the American Ornithologists' Union still sanctions the old all-inclusive Raptores.

FALCONIO, fäl-kō′nyō, Diomede, Cardinal (1842–1917). An American Roman Catholic prelate, born at Pescocostanzo, in the Abruzzi, Italy. Entering the Franciscan Order in 1860, he finished his novitiate in 1865, was sent as a missionary to the United States, where he became a naturalized citizen, and was ordained a priest in the following year. In 1866 he became professor and vice president of St. Bonaventure's College (Allegany, N. Y.) and two years later president of the college and seminary of St. Bonaventure. From 1872 to 1882 he was administrator of the cathedral at Harbor Grace, Newfoundland. Returning to Italy in 1883, he was twice elected provincial of the Franciscans and was also commissary, visitor general, synodial examiner, and procurator general of the order at various times. He was consecrated Bishop of Lacedonia in 1892 and raised to the archbishopric of Acerenza and Matera in 1895. He served as apostolic delegate to Canada from 1899 to 1902 and to the United States from 1902 to 1911, when he was elevated to the cardinalate. A volume of his *Pastoral Letters* was translated into French in 1900.

FALCONRY, fô′k'n-rĭ. The art of training falcons born in a state of freedom so that when they have flown and captured their quarry they will, instead of devouring it, give it up to their trainer. They will pursue and capture on the wing the heron, partridge, lark, rook, magpie, wild duck, pigeon, and rabbit, and in India game as large as the deer. In ancient times this sport was called hawking, a term still preserved in many places. Nowadays falconry is the term applied to the sport and all that pertains to it; hawking, to its actual practice out in the field. Falconry as a sport is of very ancient origin. Apparently it was practiced in China as early as 2000 B.C., in Japan 600 B.C., and in Babylonia in 1700 B.C. In England, after the Norman Conquest, it was much indulged in by kings, nobles, and ladies; and in those days the rank of the individual could be indicated by the particular species of hawk carried on his wrist. Thus, royalty carried the gyrfalcon, an earl the peregrine, a yeoman the goshawk, a priest the sparrow hawk, and a servant the kestrel. In the seventeenth century the sport declined; in the eighteenth century it partially revived, but again fell off about the year 1727, when the art of shooting birds on the wing became the fashion. In the present day its restoration in England, Holland, and France is attended with growing success, though no country in the world has such a variety of hawks, or such opportunities for flying them, as the United States, in which country and Canada several successful clubs have been organized for the encouragement of the sport. In Spanish America hawking was long esteemed as a favorite sport. In the East, from China to Morocco, falconry still maintains its old-time position as a field sport.

In falconry two distinct kinds of hawks are used—the long-winged, or true falcons, and the short-winged. The first are represented chiefly by the gyrfalcon and peregrine; the second by the goshawk and sparrow hawk; and though for certain purposes the male is superior, as a rule the females of each species are much more highly esteemed for sporting purposes, from their being larger and more powerful. "Long-winged" hawks may also, as a rule, be distinguished from the "short-winged" by their having a "tooth" or notch on the upper mandible; from the second feather of the wing being either longer or as long as the third; from the color of the iris, which is of a brown hue, so dark as sometimes to appear black; and from their impetuous "stoop" when they descend from a height on their prey.

The gyrfalcon (q.v.) is the largest species, but the peregrine is in greatest favor with falconers, and if taken from the nest, as is usually the case, and carefully trained, affords great sport. No hawk is fit for sporting purposes until it has undergone a careful process of training. The young hawk taken from the nest of its wild parent is more easily trained than that which has been trapped in a wild state when at maturity; but in either case considerable practice is necessary before the falcon can be considered fully equipped for the sport. The following are some of the terms used in falconry: Claws, *pounces;* wings, *sails;* lower stomach, *pannel;* feathers, hair, etc., ejected at the mouth, the *castings.* A young hawk from the nest is an *eyess* or *eyas;* a mature wild hawk is a *haggard* or *blue hawk;* hawks in their first year are *red hawks*—the term *red* being applied merely as a title of distinction between the young hawk and the eyess or nestling, the colors of the two being in reality the same. Fluttering is *bateing;* fighting with each other, *crabbing;* sleeping, *jonking.* The prey is termed the *quarry.* When the hawk strikes her quarry in the air and clings to it she *binds;* when she flies off with it she *carries.* Dead game is the *pelt. Stooping* or *swooping* is the act of descending with closed wings from a height at the object of its prey. When game flies into a cover it *puts in.* When the hawk is molting her feathers she is *mewing;* after her first molt, or (sometimes) after a molt in confinement, she is *intermewed.* Mending the feathers artificially—a necessary operation if any have been accidentally broken—is termed *imping;* blunting bill and talons, *coping.* The *cadge* is a frame of wood with four legs, carried by means of straps passed over the bearer's (the cadger's) shoulders, and used when there are several casts of hawks to be taken to the field. Falcons are very pugnacious, and if not kept separate would soon kill each other. The *screen* or *perch* is a perch guarded by a falling piece of canvas to support the hawks in case of their leaping down from their block; upon this the hawks are placed at night in an apartment called the *mews.*

Bibliography. The best of the older works are those of Turberville, published in 1575, and that of Sir John Sebright (London, 1828). For more recent treatises, consult: Salvin and Broderick, *Falconry in the British Isles* (London, 1873); Freeman and Salvin, *Falconry, its Claims and Practice* (ib., 1859); Freeman, *Practical Falconry* (ib., 1869); Breck, "An Ancient Sport in the New World," in *Outing,* vol. lxiii (New York, 1914), a readable account of the author's experiments in falconry with a Cooper's hawk; Harting, *Bibliotheca Accipitraria: A Catalogue of Books, Ancient and Modern, Relating to Falconry* (London, 1891).

FALDSTOOL, fạld′sto͞ol (OF. *faldestoel* or *faudestuel,* ML. *faldistolium,* from OHG. *falden,* fold, and *stol,* chair). (1) In ecclesiastical usage, a folding chair on which a bishop sat when not occupying his throne in his cathedral, or when in another church or cathedral. Other prelates having the right to full pontificals also used it. (2) In the English church the name is used for the folding stool on which worshipers kneel in devotions: especially that on which the kings kneel at consecration. (3) A small desk in the churches from which the litany is read is sometimes called the faldstool.

FALEME, fȧ-lā′mā. An important tributary of the Senegal River, in west Africa, rising in the French dependency of Futa-Jallon and flowing into the Senegal from the south (Map: Africa, C 3). The direction of its course is a little west of north, and its length is estimated at about 300 miles.

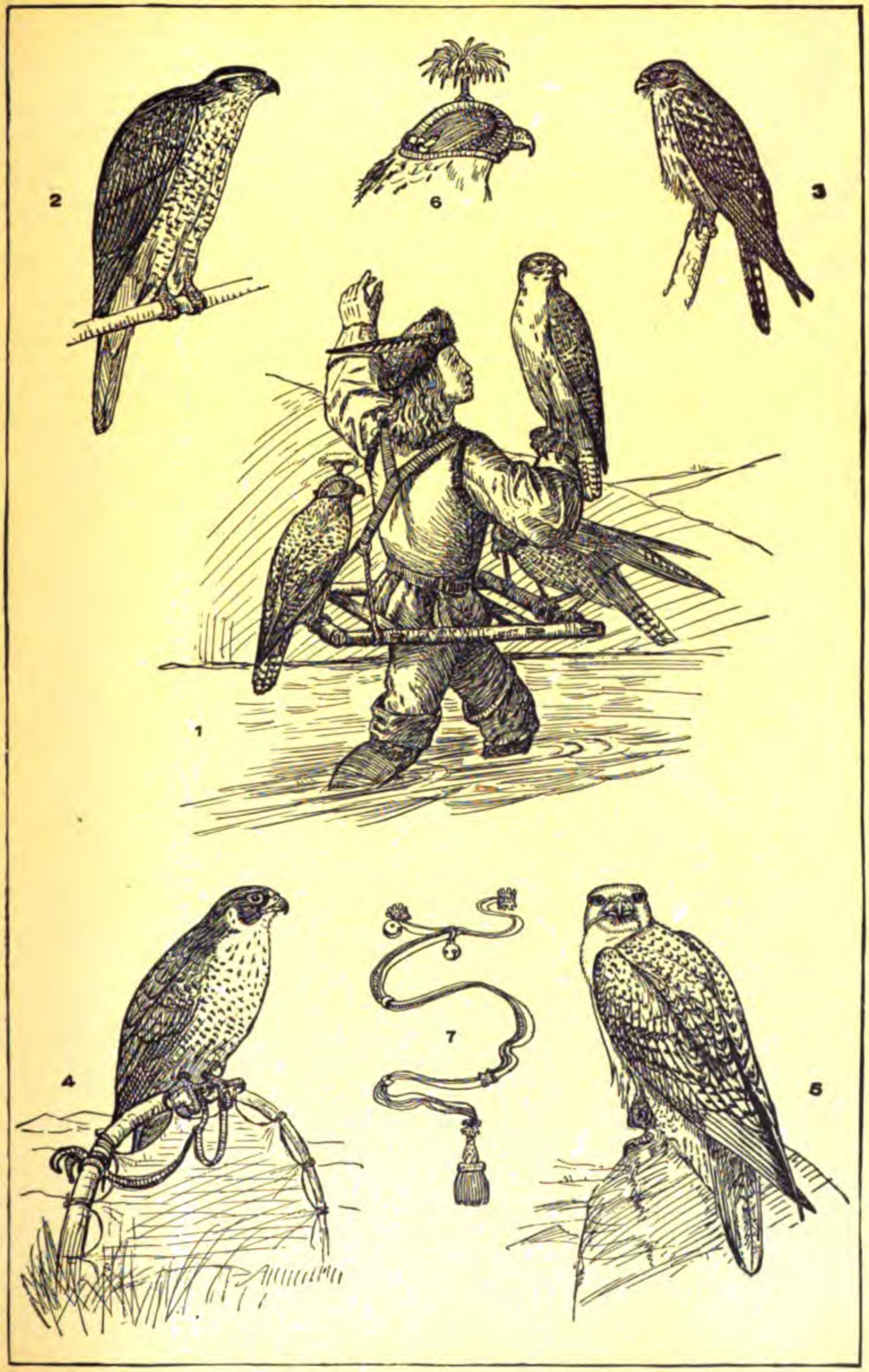
FALERII, fȧ-lē′rĭ-ī. A city in the southern part of Etruria, west of the Tiber and the Sabini and north of Mount Soracte. The inscriptions show that its inhabitants, the Falisci, were not Etruscans, but were closely allied to the Latins. In the early Roman annals Falerii appears as allied with Veii and other neighboring enemies of Rome; it finally joined the Roman League, however, it is said, in 343 B.C. For some unknown reason it revolted towards the close of the First Punic War, 241 B.C., and was then destroyed by the Romans, who compelled the inhabitants to settle in the plain near by, where is now the village of Santa Maria di Falleri. Here a Roman colony was settled in the time of the triumvirs, or later, whence the place took the name of Colonia Junonia Faliscorum. But this Roman Falerii does not appear to have ever acquired any importance, for the temple which anciently attracted so many pilgrims stood on the site of the older town. This temple, found at Lo Scotaso, in 1888, was of wood, with decorations of colored terra cotta. In the eleventh century the inhabitants removed to the strong position of the ancient Falerii, which finally obtained the name of Cività Castellana (q.v.). Ruins of the Roman or later Falerii, consisting of a part of the ancient walls, well preserved, are still visible; in some places these walls are 56 feet high and 7 to 9 feet thick; 50 towers are still preserved. Excavations in the neighborhood of the more ancient town have led to the discovery of extensive cemeteries, containing a series of graves, of great value as indicating the growth of civilization in Italy. Consult: Dennis, *Cities and Cemeteries of Etruria* (London, 1883); *Notizie degli Scavi* (Rome, 1879, 1882–83, 1886–88, 1909, 1911); Nissen, *Italische Landeskunde,* vol. ii (Berlin, 1902).

FALER′NIAN WINE (Lat. *Falernum, Falernum vinum*), one of the favorite wines of the Romans, so called from the Ager Falernus, the district in which it was grown, which lay in the northern portion of Campania, between the Massican hills and the northern bank of the Vulturnus. It is described by Horace as, in his time, surpassing all other wines in repute. In the time of Pliny, however, Falernian wine had already, owing to a want of care in its cultivation, begun to decline in quality. A wine produced in this district is still known as Falerno. Consult Nissen, *Italische Landeskunde,* vol. ii (Berlin, 1902).

FALERNUS AGER. See FALERNIAN WINE.

FALGUIÈRE, fȧl′gyâr′, JEAN ALEXANDRE JOSEPH (1831–1900). A French sculptor and painter, born in Toulouse. He studied in Paris under Carrière, Belleuse, Chenillon, and Jouffroy, and won the Prix de Rome in 1859. While still at Rome, he sent to the Salon his "Winner of

FALCONS AND FALCONRY



1. A FALCONER OF THE 17th CENTURY, CARRYING HAWKS AFIELD.
2. GOSHAWK (*Astur palumbarius*).
3. KESTREL (*Tinnunculus alaudarius*).
4. PEREGRINE FALCON (*Falco peregrinus*), on portable perch.
5. GYRFALCON (*Falco gyrfalco*).
6. A FALCON'S HOOD.
7. A FALCON'S JESSE, WITH BELLS.

the Cock Fight" (1864, now in the Luxembourg), a work breathing the very spirit of antiquity; it assured his reputation. In 1868 he gained the medal of honor with "Tarcisus Martyr" (Luxembourg), the most personal of his creations. Falguière was essentially a realist, of great natural talent and with a profound love of nature and life, but lacked thoughtfulness and was too impatient for careful execution in marble. His best works, besides the two early ones mentioned, are his commemorative statues, including "St. Vincent de Paul" (Panthéon), "Corneille" (Théâtre Français), "Gambetta" (Amiens Museum), "Lamartine" (in Mâcon), and "Lafayette" (in Washington)—all of which are good in expression and pose and show psychological insight. A series of bold but often rhythmically poetic nudes, such as "Eve," "Diana," "Heroic Poetry," "The Woman with the Peacock" (1890), and "The Dance" (1896), gained him the appellation of the "Parisian Praxiteles." His ambitious groups, such as the "Triumph of the Republic"—a large bronze quadriga on the Arc de Triomphe—and the groups for the Trocadéro and the Panthéon, were not equally successful. Although primarily a sculptor, his paintings, such as "Fan and Poniard" and "Spanish Dwarfs" (Luxembourg), in the manner of Velazquez and Goya, are robust and well executed. Falguière received many medals and was officer of the Legion of Honor (1878) and member of the Institute (1882). Consult: Benédite, "Alexandre Falguière," in *Librairie de l'art* (Paris, 1902); Geoffroy, in *Gazette des Beaux Arts* (ib., 1900; Eng. trans.); Eaton's *Handbook of Modern French Sculpture* (New York, 1913).

FALIER, fȧ-lyâr′, MARINO (c.1285–1355). A celebrated Venetian Doge, elected to office in 1354, when about 70, after rendering the Republic great service in many different offices, administrative, military, and diplomatic. According to the account usually given, his bitter resentment was aroused by an offensive libel on himself, the author of which owed him a grudge. The punishment imposed on the young noble by a patrician tribunal seemed to Falier wholly inadequate, and in order to avenge this double slight he organized an audacious plot with the object of overthrowing the Republic and massacring the heads of the aristocracy, to be followed by his own assumption of sovereign power. The real facts have always remained obscure, but it seems probable that Falier was trying to make himself supreme lord of Venice and many of the people, exasperated by the conduct of the nobility, were willing to aid him. The conspiracy was, however, revealed on the eve of its execution, and Falier was arrested. He suffered death by decapitation on April 17, 1355. In the hall of the Great Council, which contains the portraits of all the doges, the space allotted to that of Falier is draped with a veil of sable, and bears the following inscription: "Marino Falier, executed for treason." Byron has made the fate of Falier the subject of a drama. Consult Brown, *Studies in the History of Venice*, vol. i (London, 1907), and Lazzarini, *Marino Faliero, la Congiura* (Venice, 1897).

FALK, JOHANN DANIEL (1768–1826). A German author and philanthropist, born in Danzig. After studying theology at the University of Halle, he turned to literature, wrote several satirical poems, and in 1797 became, through Wieland (q.v.), a member of the Weimar literary circle. When Napoleon's army invaded the duchy in 1806, his knowledge of the French language enabled him to moderate to some extent the spoliation of the country, and later caused him to be created a counselor of legation. In 1813 he founded the Society of Friends in Need, and in the same year established at Weimar the first institution in Germany for the care and education of neglected and orphan children. This was taken over by the state in 1829 and still exists as the Falk'sches Institut. Falk's publications include: *Der Mensch und die Helden* (1798); *Oceaniden* (1812); *Goethe aus näherm persönlichen Umgange dargestellt* (1832; 3d ed., 1856). Consult Stein (Nietschmann), *Johannes Falk: Ein Zeit- und Lebensbild* (Halle, 1881).

FALK, MAX (1828–1908). An Hungarian politician and publicist. He was born and educated at Pest, entered the Polytechnic Institute at Vienna, and became a member of the Academic Legion in 1848. As editor of the *Wanderer* of Vienna, he strongly advocated the restoration of the Hungarian constitution, and, soon after the negotiations concerning the compromise with Hungary had been resumed, he was appointed private lecturer on Hungarian history and literature to the Empress Elizabeth. As editor in chief of the *Pester Lloyd*, he made his influence widely felt. In 1869 he was elected to the Hungarian Parliament, where he identified himself with the party of which Deák, Eötvös, and Andrássy were the most prominent representatives. With Brachelli he published the twelfth German edition of Gallettis' *Allgemeine Weltkunde* (1859–60). His independent literary productions, which include the biography, *Graf Stephan Széchenyi und seine Zeit* (1868, also published in Hungarian), appeared chiefly in the *Oesterreichische Revue*. He wrote also *Rückerinnerungen an die Königin Elisabeth* (1902).

FALK, fälk, (PAUL LUDWIG) ADALBERT (1827–1900). A Prussian statesman, born at Metschkau, Silesia, Aug. 10, 1827. He was the son of a Protestant clergyman and studied law at Breslau and Berlin. In 1847 he entered the state service of Prussia; in 1850 he was appointed Assistant State Attorney at Breslau and in 1853 State Attorney at Lyck. In 1858 he was elected to the Prussian Chamber of Deputies and served as a member of the committee on petitions, budget, and military affairs (1858–61). In 1862 he was appointed counselor of the Court of Appeals in Glogau, Silesia, and in 1867 was elected to represent that district in the provisional Parliament of the North German Confederation. In 1868 he was permanently assigned as counselor of the Ministry of Justice and devoted himself zealously to the new codification of laws for the North German Confederation, performing a similar work afterward for the German Empire. In 1871 the Emperor appointed Dr. Falk one of the representatives of Prussia in the Federal Council. In 1872 he succeeded Von Mühler as Prussian Minister for Ecclesiastical Educational Affairs (Kultusminister). He introduced a law, passed March 11, 1872, according to which the supervision of all schools was declared to be the exclusive prerogative of the state. It was carried against the united efforts of the Roman Catholic and conservative Protestant parties of the Prussian Parliament. Falk continued by a number of measures to assert further the exclusive right of the state to legislate in all school affairs. A rescript of June 15, 1872, excluded members of ecclesiastical orders and congregations from positions in the public schools. In May, 1873, an Act was passed conferring upon the state the right of supervising Roman Catholic seminaries. It was required also that candidates for the clerical office should undergo a certain amount of secular training at the universities, and that every ecclesiastical appointment should receive the sanction of the secular authorities. A royal tribunal for ecclesiastical matters was also set up. This legislation, which the Pope denounced as invalid, Feb. 15, 1875, was disregarded by the Roman Catholic bishops, and Bismarck, supported by Falk, imposed penalty after penalty in order to establish the supremacy of the state. Refractory bishops were imprisoned, deposed, and banished; the contributions of the government were withdrawn from the clergy who incurred its displeasure; religious orders were dissolved; and the administration of church property was taken from the clergy and invested in bodies of laymen. Dr. Falk's policy was no more acceptable to the orthodox Protestant party than to the Roman Catholics, and the difficulties of his position led him to resign in July, 1879. The Falk laws were modified by his successors, Von Puttkamer and Gossler, despite the opposition of Falk as member of Parliament. In 1882 he accepted a high judicial appointment at Hamm and died there, July 7, 1900. His *Reden gehalten in den Jähren 1872–79* appeared at Berlin in 1880. Consult Fischer, *Adalbert Falk* (Hamm, 1900), and J. F. von Schulte, "Erinnerungen und Erlebnisse mit Adalbert Falk," in *Deutsche Revue*, vol. xxxii (Stuttgart, 1876). See KULTURKAMPF.

FALKE, fälke, GUSTAV (1853–1916). A German poet, born in Lübeck, nephew of Jakob von Falke and of Johannes Friedrich Gottlieb Falke. He was educated at the Lübeck Catharineum, was a bookseller for seven years, and then (after 1878) a music teacher in Hamburg, and in 1903 on his fiftieth birthday received an annual grant of 3000 marks from the Hamburg Senate and Commonalty. He then devoted himself entirely to literature, especially poetry, although he had previously written fiction, including *Aus dem Durchschnitt* (1892), *Landen und Stranden* (1895), and *Der Mann im Nebel* (1899). In his poems he was at first rather markedly influenced by von Liliencron, but later showed more individuality. Among his volumes of verse, besides some juveniles, were: *Mynheer der Tod* (1892); *Tanz und Andacht* (1893); *Neue Fahrt* (1897); *Mit dem Leben* (1899); *Hohe Sommertage* (1902); an epic in hexameters, *Der gestiefelte Kater* (1904); *Frohe Fracht* (1907); Hamburg (1908) in the series called *Städte und Landschaften*.

FALKE, JOHANNES FRIEDRICH GOTTLIEB (1823–76). A German historian, brother of the preceding. He was born at Ratzeburg and studied theology, philology, and history at Erlangen. In 1855 he was appointed a custodian, and in 1856 secretary of the Germanic Museum at Nuremberg; and in 1859 he became director of the manuscript department in that institution. In 1862 he was appointed secretary of the government archives at Dresden, where he occupied the position of archivist at the time of his death. He was founder and coeditor of the *Zeitschrift für deutsche Kulturgeschichte* (1855–59), a periodical devoted to the economic history of Germany. His independent works include: *Geschichte des deutschen Handels* (1859–60); *Die Hansa als deutsche See- und Handelsmacht* (1862); *Geschichte des deutschen Zollwesens* (1869).

FALKENHAYN, GENERAL ERIC VON. German War Minister. See VOLUME XXIV.

FALKENSTEIN, fälk'en-stīn, JULIUS AUGUST FERDINAND (1842–). A German explorer. He was born in Berlin, and studied medicine and geology at the university in that city. As a member of the exploring expedition sent by the African Society of Germany to Loango (1873–76), he made important scientific discoveries. His valuable collections included the first gorilla ever transported alive out of Africa. In 1881 he founded the General School Association of Germany, a society formed for the strengthening of German influence in the schools of other countries. His publications include: *Die Loango-Küste in 72 Original-Photographien* (1876); *Die Loango Expedition* (1879); *Afrikans Westküste: Vom Ogowe bis zum Damara Land* (1885); *Aerztlicher Reisebegleiter und Hausfreund* (10th ed., 1893).

FALKIRK, fa̤l'kẽrk (named from a church built during the eleventh century by Malcolm Canmore). A parliamentary and municipal burgh and market town of Stirlingshire, Scotland, about 3 miles southwest of its seaport, Grangemouth, on the Firth of Forth, and 24 miles northwest of Edinburgh (Map: Scotland, E 4). Falkirk consists principally of a long, irregular street. There is an equestrian statue of the Duke of Wellington, erected in 1854. Among its notable buildings are the town hall, county buildings, art school, free library, and cottage hospital. Its parish church has some ancient monuments, but was itself rebuilt in the year 1810. The church, church lands, and barony belonged of old to the abbey of Holyrood. It is the centre of the Scotch iron-founding trade, the principal works being at Carron. There are several extensive collieries in the neighborhood as well as distilleries. Its three annual cattle fairs (trysts), once so famous, have practically been supplanted by a weekly market. Falkirk is a station on the North British Railway and is connected with the east and west coasts by the Forth and Clyde Canal. Pop., 1901 (municipal burgh), 29,271; 1911, 33,574. The town is of great antiquity, having been a place of some importance as early as the eleventh century. On a small eminence near Falkirk an important engagement was fought, July 22, 1298, between the English under Edward I and the Scottish army under William Wallace (q.v.). The Scottish forces were outnumbered nearly three to one and were driven from the field with the loss of 20,000 men. Wallace was forced to seek concealment, and Edward's hold on the southern part of Scotland was strengthened. Near Falkirk, Jan. 17, 1746, Charles Edward, the young Pretender, defeated an English army under General Hawley.

FALKLAND, fa̤k'lənd. A royal burgh in Fifeshire, Scotland. situated at the northeastern base of the Lomond Hills, 22 miles north of Edinburgh (Map: Scotland, E 3). Pop. 1901 (civil parish), 2229; 1911, 2356. It is noted for its sixteenth-century royal palace, built upon the site of an ancient castle of the Macduffs, thanes of Fife, and now the property of the Marquis of Bute, who has had it carefully restored. It is rich in memories of the births, lives, imprisonments, and murders of Scottish princes and kings. In 1715 it was garrisoned by Rob Roy (q.v.). Consult Wood, *Historical Description of Falkland* (Edinburgh, 1888).

FALKLAND. The first novel of Bulwer Lytton, named after its hero, and published anonymously in 1827. It is a singularly gloomy work, described by the author as "to me what the *Sorrows of Werther* was to Goethe."

FALKLAND. The leading character in William Godwin's novel *Caleb Williams.*

FALKLAND, LUCIUS CARY, second VISCOUNT (c.1610–43). An English writer and politician. He was educated at Trinity College, Dublin, and at St. John's College, Cambridge. About 1629 he inherited his maternal grandfather's fortune and devoted himself to literature. By his father's death, in 1633, he became Viscount Falkland. In 1633 he was created a gentleman of the Privy Chamber to Charles I and took part in the expedition against the Scots in 1639. In 1640 he entered Parliament as member for Newport and the Isle of Wight. He opposed Laud during the Short Parliament and in the Long Parliament took sides against Strafford. He became Secretary of State in 1642, and at the outbreak of the Civil War he joined the King's party. But he was so dissatisfied with both parties that he courted death, and was killed at the battle of Newbury. His principal work is *A Discourse on the Infallibility of the Church of Rome* (1660). His poems, edited by A. Grosbart, were published in 1871. Consult Marriott, *The Life and Times of Lucius Cary, Viscount Falkland* (New York, 1907), and Longueville, *Falklands* (London, 1897).

FALKLAND ISLANDS. A British colony in the South Atlantic, between lat. 51° and 52° 45′ S. and long. 57° 20′ and 61° 46′ W. (Map: South America, H 8). The colony is about 300 miles east of the Strait of Magellan and 1100 miles south of Montevideo. The Falkland Islands consist of East Falkland (about 3000 square miles) and West Falkland (2300 square miles), the two being separated by Falkland Sound, and about 100 small islands (nearly 1200 square miles); total area, about 6500 square miles. South Georgia, an island lying with several islets about 54° 30′ S. and 36° to 38° W., is a dependency; area of the group, about 1000 square miles. Also regarded as dependencies of the colony are the South Shetlands, Graham's Land, the Sandwich group, and the South Orkneys (on which the Argentine government has, with British consent, established a meteorological station).

East and West Falkland are for the most part low-lying moorland interspersed with rocks. A few mountains exceed 2000 feet, the highest being 2290 feet, in West Falkland. (South Georgia is much more mountainous, at least one mountain exceeding 5000 feet.) The soil is chiefly soft peat; there are no trees and little vegetation besides grass. The coasts are deeply indented, and there are numerous well-protected harbors. The climate is not unhealthful, but cool; the range of temperature in the summer is 40° to 65° and in the winter 30° to 50°, the mean being 42°. The weather is often disagreeable on account of strong winds and drizzling rains, but the annual rainfall seldom exceeds 25 inches. There are practically no roads, and communication is by sea or horseback. The only industries are sheep farming and whaling. Live stock in 1912: 711,367 sheep, 7529 cattle, 3665 horses, and 60 swine. In 1910 imports and exports were valued at £94,294 and £308,930 respectively; in 1912, £93,264 and £623,875. The trade is largely British. The wool export in 1911 was 4,643,781 pounds. In the dependencies the whaling industry has recently made rapid progress. Exports from South Georgia in 1911 (not included above) were valued at £426,438. There is monthly mail communication with England. The population, which is almost entirely on the two principal islands, was 2043 in 1901 and 3275 in 1911 (2370 male, 905 female). The inhabitants are nearly all British. Stanley, with a good harbor, on the east coast of East Falkland, is the only town; pop., 905. It has a government and a Roman Catholic school. Traveling schoolmasters visit other parts of the islands. The colony is administered by a governor; there are an executive and a legislative council, all members being appointive.

The Falkland Islands were discovered by Davis in 1594 and visited by Hawkins two years later. France took possession in 1764, and a small colony was established; this in 1766 was bought by the Spaniards. The English took West Falkland in 1767, but were driven out by the Spaniards. In 1820 a settlement was made by the Republic of Buenos Aires. The islands were finally taken by Great Britain in 1832, and in 1843 a civil administration was established. The colony has been self-supporting since 1885. In 1912 the revenue was £34,037; expenditure, £33,508. There is no public debt. A wireless station was set up at Stanley in 1912. Consult *British Empire Series* (London, 1900), and Murdock, *From Edinburgh to the Antarctic, 1892–93* (London, 1894).

FALKNER, fąk′nẽr, ROLAND POST (1866–). An American statistician, born at Bridgeport, Conn. He graduated at the University of Pennsylvania in 1885 and afterward studied at Berlin, Leipzig, and Halle (Ph.D., 1888). For three years (1888–91) he was an instructor, and for nine years (1891–1900) associate professor of statistics, in the Wharton School of Finance and Economy (University of Pennsylvania). In 1900 he was appointed chief of the division of documents in the Library of Congress at Washington. He was secretary of the International Monetary Conference of 1892, and edited, from its beginning in 1890 until 1900, the *Annals* of the American Academy of Political and Social Science. Of this latter organization he was first vice president in 1896–97. From 1904 to 1907 he served as Commissioner of Education in Porto Rico; from 1908 to 1911 he was statistician in charge of school inquiries for the United States Immigration Commission, and he then became assistant director of the census. Besides a translation of August Meitzen's *History, Theory, and Technique of Statistics* (1893), he published much on statistical subjects, and contributed to the NEW INTERNATIONAL ENCYCLOPÆDIA.

FALKNER, THOMAS (1707–84). An English Jesuit missionary, born in Manchester. As surgeon on board the *Assiento,* a slave ship belonging to the South Sea Company, he sailed to the Guinea coast in 1731 and thence to Buenos Aires, where he was so kindly treated by the Jesuits during a dangerous illness that he determined to enter their order. He was ordained in May, 1732, and during the following 35 years he worked as a missionary in Paraguay and the vast region between the Rio de la Plata and the

Strait of Magellan, mostly among the natives. Upon the expulsion of the Jesuits from South America in 1768, he returned to England, where he was chaplain to several distinguished Catholic families. His religious work was materially aided by his medical and surgical skill. He left several works in manuscript, including four volumes, *Botanical, Mineral, and Like Observations on the Products of America* (date unrecorded), and published (1774) *A Description of Patagonia and the Adjoining Parts of South America*, which seems to have been edited (and spoiled) by a friend.

FALKNER ISLAND. An island in Long Island Sound, about 5 miles southeast of Guilford, Conn. It has a lighthouse, with a white flashing light, 93½ feet above mean high water, which is visible for 15 (nautical) miles, and a fog-signal siren.

FALKÖPING, fäl′chĕ′pĭng. A small town and railway junction in Skaraborg, Sweden (Map: Sweden, E 7). Pop., 1899, 3066; 1910, 4800. It is the scene of the victory in 1389 of Margaret, Queen of Denmark and Norway, over Albert of Mecklenburg, King of Sweden, which enabled her to unite Sweden with the other kingdoms. See, on the Union of Kalmar, under Kalmar.

FALL, Doctrine of the. The term is especially used for that form of the explanation of the origin of sin and human evil which appears in the later Jewish, Mohammedan, and Christian religions. It is based on the supposition that the story of Eden in Gen. ii and iii represents, in some form, an historical event. Until modern times the story was taken literally. Later Judaism began to use it as the explanation of sin in the race. This is seen in the Wisdom of Solomon, an Alexandrian Jewish book of the first century B.C. (ii. 23 ff.), in 2 Esdras, of the first century A.D. (iii. 21 f, iv. 30, vii. 46 ff., viii, 35). In the New Testament it appears only in Paul's writings (i Cor. xv. 21 f., Rom. v. 12 ff.). These show us that, in the Jewish thought of the time, sin and death were regarded as coming upon man because of Adam's sin. Some kind of unity between man and his supposed ancestor Adam is assumed. These passages, however, give no answer to the question how Adam, if created pure by God, came to sin, nor what is the nature of the connection between man and his ancestor, nor whether man is "guilty of Adam's sin." Such questions arose when Christianity entered the Greek world, and philosophical theology began to be formed. By the Greek fathers the consequences of Adam's fall were regarded as physical and moral death, the control of unregenerate man by Satan, and the great attractiveness of evil. They held that the fall was the result of the temptation of Satan. Augustine, the greatest systematic theologian of the Christian Church, added to these results the complete enslavement of the human will, so that man can now choose good only by the grace of God. Pelagius refused to admit the complete enslavement of the will, since this would, he held, leave man irresponsible for his own personal sin. Augustine met this position by his theory of the unity of the human race. All human nature was deposited in the first man and was, as it came from God, pure. It was corrupted by Adam's sin and, in that corrupt state, comes into the individuality of each of Adam's descendants, so that all are responsible for the consequences of the first sin and are guilty, not as separate persons; but as members of the race which shares human nature from Adam. This solidarity of the race rests upon ideas of Platonic realism and was essential to the Augustine idea of the fall and its results. See Original Sin.

The problem of how man, created pure, could fall, was discussed more fully by the Calvinistic theologians and their opponents. Some Calvinists held that the fall was decreed by God; others that it was only permitted. (See Calvinism.) The Arminians, like the Pelagians, held that the fall did not entirely destroy the power of a good choice, but weakened it, and that man is not guilty for original sin.

Modern biblical scholarship regards the story of Adam not as history, but as a myth, whose original purpose was not to explain the origin of sin, but of the evils of life. It rejects the story, therefore, as a legitimate basis for theological speculations. Evolution has taken the place of Genesis as the explanation of the origin of man. This involves certain radical changes. Man has arisen from the brutes, and his growth has been gradual. There was no fall from pristine purity, for there is no evidence that pristine purity ever existed. Sin came in when man began to perceive higher possibilities and chose the lower instead of the higher. It is the survival of selfishness and passion after selfishness and passion are seen to be wrong; but to call that experience a fall is no more correct of the race than of each individual child. The story of Adam may be treated as an allegory of what happens, not once for all, but in the life of every man; it becomes, not the basis of a metaphysical theology, but the parable of human experience. Men are tempted by the appeal to the senses from without; their desires respond; they choose what opposes known commands of the higher laws; and they, and others with them, suffer in consequence. Physical death is no longer regarded as the result of sin. It is an incident of organized life, long antedating the evolution of man. The problems of predestination, free will, and the connection of man with the sins of his ancestors are swallowed up in the larger problems of an order of the world, of human consciousness, and of heredity, which modern thought is for the most part content to leave as yet unsolved. Consult: Fisher, *History of Christian Doctrine* (New York, 1896); Harnack, *History of Dogma* (Boston, 1894–99); Clarke, *Outline of Christian Theology* (New York, 1899); Brown, *Christian Theology in Outline* (ib., 1906); Mackintosh, *Christianity and Sin* (ib., 1914).

FALL, Albert Bacon (1861–). An American legislator, born at Frankfort, Ky. After an education in country schools he taught school, studied law, and was a practicing attorney from 1889 to 1904. In 1898–99 he was captain in the First Territorial Volunteer Infantry. He acquired property interests in lumber, lands, stock farms, and railroads in New Mexico and in mines in Mexico. He served several terms in the New Mexico Territorial Legislature, twice as Attorney-General, as Associate Justice of the Supreme Court of New Mexico, and as a member of the Constitutional Convention. Upon the admission of New Mexico to statehood he was elected United States Senator for the short term in 1912, and he was reëlected for the term 1913–19.

FAL′LACY (Lat. *fallacia*, deception, from *fallax*, deceitful, from *fallere*, to deceive; connected with Gk. σφάλλειν, *sphallein*, to overthrow, Skt. *phal*, to deceive, Lith. *pùlti*, OHG. *fallan*, Ger. *fallen*, Icel. *fallay*, AS. *feallan*, Eng. *fall*). The incorrect performance of the process of reasoning, so as to lead to an unwarranted conclusion. The science of logic finds that sound reasoning proceeds in accordance with certain rules, and when any of these rules is violated, a logical fallacy is the result. There has been much discussion as to the proper classification of fallacies, and even now no agreement has been reached. But it is obvious that, as a fallacy is a violation of some logical law, an adequate exhibition of the correct processes of thought will carry with it an adequate exhibition of the possible fallacies. There is only one further difficulty. Language is not a perfect instrument for the expression of thought; and the same kind of logical mistake may be expressed in several ways, and each one of these modes of expression may be important enough to require treatment. This would lead to the old traditional classification into fallacies not complicated by verbal difficulties (*extra dictionem*) and those so complicated (*in dictione*). Those not complicated by verbal difficulties need no detailed treatment, as they are all obvious violations of some logical rule. All that need be done here is to give the names of some of the most common fallacies *extra dictionem*. Thus, the fallacy of the *undistributed middle* is a violation of the syllogistic law that the middle term should be distributed at least once. The *illicit* process of the major or minor term is a violation of the syllogistic law that neither extreme (major or minor) may appear in the conclusion in a quantity exceeding that belonging to it in the premises. The *quaternio terminorum*, or *four terms*, violates the law that a syllogism should have three, and only three, terms. The *double negative* violates the law that at least one of the premises of every syllogism that is reduced to proper expression should be affirmative. The *petitio principii*, in the form in which it belongs here, violates the rule that there should be three distinct propositions in a syllogism; the violation occurs when the conclusion to be proved is assumed in a premise. But any really significant *petitio principii* is a fallacy *in dictione*, for it is only when the identity of conclusion and premise is masked that a *petitio principii* is liable to be seriously made or seriously taken. Still another form of the *petitio principii*, called *circulus in probando*, is a fallacy *extra dictionem* which is possible only when there are two or more syllogisms interrelated in such a way that the conclusion of each syllogism is the premise of some other. In this way the conclusion, or what is proved, in one syllogism is used in another syllogism as a basis of proof for a proposition which in its turn ultimately comes to be used as a basis of proof for the first conclusion. Hence the Latin name, meaning a circular process of reasoning. In English this fallacy is often called a *vicious circle*. The term *petitio principii* is sometimes applied to arguments which are not fallacious at all, but which employ as premises propositions the truth of which is not admitted by those to whom the argument is addressed. The fallacy of *the consequent* is a violation of the law that in hypothetical propositions the truth of the apodosis (consequent) is not to be taken as carrying with it the truth of the protasis (antecedent). *Non causa pro causa*, *post hoc ergo propter hoc*, and *false cause* are names of a fallacy which consists in violating the inductive canon that a temporal antecedent must be distinguished from a cause. The fallacies *in dictione* are not usually classified according to any systematic principle, but names are given to the most frequent or the most subtle of them. A very comprehensive distinction is that between fallacies in which the disguise of the illogical operation is effected by a single word (equivocation), and those in which it is effected by the structure or other peculiarity of a sentence or phrase as a whole (amphiboly). Equivocation or amphiboly, when it appears in the middle term of a syllogism, is called an *ambiguous middle*. If the equivocation arises from misplaced emphasis or accent, it is called the fallacy of *accent*. The so-called fallacies of composition and division may be either equivocations or amphibolies. Thus "all men" may mean either every man singly (distributive) or the totality of mankind taken as a unit (collective). Any violation of logical rules arising from failure to make this distinction is a fallacy of *composition* when the distributive use is mistaken for the collective; in the reverse case there is a fallacy of *division*. These same fallacies of composition and division are amphibolies when the ambiguity between distributive and collective use lurks not in a single word (as above in the word "all"), but in a phrase. Thus, from the two premises "the animals walk two by two," and "Two and two are four," to argue that "The animals walk by fours" is a fallacy of composition arising from an amphiboly. Another way in which a fallacy may arise is from neglect to observe a qualification tacitly but really made. Thus, the statement "What I bought yesterday, I ate to-day," in civilized communities really means "What I bought in the marketable form yesterday, I ate to-day after it had undergone whatever change was necessary to make it edible." If now a caviler, refusing to recognise these tacit qualifications, were to say "You bought raw meat yesterday, didn't you?" he would suggest the inference that I ate raw meat to-day. This is called *argumentum a dicto simpliciter ad dictum secundum quid*—the assumption that qualification makes no difference in the truth of a statement.

Another form of fallacy screened by verbal expression is that in which a conclusion is established which in expression resembles the point one starts out to make, but which in reality has nothing to do with that point. This is called *ignoratio elenchi*, or *irrelevant conclusion*. The so-called fallacy of *complex question* is nothing but an unwarranted assumption in putting a question. The stock example is the inquiry, "Have you stopped beating your mother?" It is more important to know what the fundamental rules of correct thinking are than to know the names given to these trifling violations of such laws. See ARGUMENT. Consult: Sidgwick, *Fallacies* (London, 1888); Ackermann, *Popular Fallacies* (Philadelphia, 1908); Roberts, *Fallacies and Facts* (London, 1911); and the logics of Mill, Creighton, etc. See also LOGIC; INDUCTION; SYLLOGISM.

FALL ARMY WORM. See GRASS WORM.

FALLEN TIMBERS, BATTLE OF. See WAYNE, ANTHONY.

FALL′FISH. The chub (*Semotilus bullaris*) of the Mississippi valley. The "red fallfish" is one of the shiners (*Notropis rubricroceus*), the male of which is "blue with a black lateral band, and the whole body more or less suffused with blood red."

FALLIÈRES, fà'lyâr', CLÉMENT ARMAND (1841–). Eighth President of the French Republic. He was born at Mézin (Lot-et-Garonne), of peasant stock, studied law, acted for a number of years as mayor of Nérac, and in 1876 was elected to the Chamber of Deputies, where he sat in the Republican Left and was an opponent of the royalists. From May, 1880, to January, 1882, during the Ferry ministry he was Undersecretary in the Ministry of the Interior, became head of that department in August of the latter year in the cabinet of Duclerc. Subsequently he was Minister of Public Instruction under Ferry (1883–85), of the Interior under Rouvier (1887), of Justice and Public Instruction under Tirard (1887–88, 1889), and of Justice again under Freycinet (1890–92). In 1890 he was elected to the Senate, and in 1899 became President of that body, being reëlected eight times in succession. In 1906 he was the candidate of the Radical Republican and Socialist "bloc" for President of the Republic to succeed Loubet. His opponent was Paul Doumer (q.v.), who possessed the support of the reactionary elements. This, combined with M. Fallières's popularity, insured his success, and on January 16 he was elected by the National Assembly by 449 votes to 371. He assumed office on Feb. 18, 1906. On assuming office he indicated his policy by grouping in the same ministry Poincaré, Moderate (*Finance*), Savrien, Radical (*Justice*), Clemenceau, Socialist Radical (*Interior*), and Briand, Socialist (*Education*), thus displaying a tendency towards the Left and a desire to give greater recognition to the working classes. In 1909 a separate Ministry of Labor was formed to which a Socialist was appointed. Fallières was succeeded in 1913 in the presidency by M. Poincaré. Consult: Weill, *Histoire du parti republicain en France* (Paris, 1900); Hanotaux, *Histoire de la France contemporaine* (Eng. trans., 4 vols., 1903); Sylvin, *Célébrités contemporaines* (Paris, 1883).

FALLING BODIES. This term is applied to bodies which are unsupported at the surface of the earth, and which under the influence of gravity (see GRAVITATION) fall or move towards its centre. The action follows from the attraction which the earth exerts on matter, and the acceleration which is thus produced is a uniform quantity for any one point—an average value being about 32.2 feet, or 981 centimeters, per second per second, though the precise quantity depends on the position on the earth's surface. This quantity it is usual to denote by g; therefore, if we let t represent the time and v the velocity, the velocity produced at the end of any period is $v = gt$. The experimental verification of the laws of falling bodies can be accomplished with the aid of *Atwood's machine;* and under that title will be found a description of the apparatus and its methods of use, together with the results which can be obtained with it. The article GRAVITATION, which gives a complete explanation of the phenomena of freely falling bodies, and also ACCELERATION and MECHANICS, should be read in this connection.

FALLING SICKNESS. See EPILEPSY.

FALLMERAYER, fäl'me-rī'ēr, JAKOB PHILIPP (1790–1861). A German traveler and historian, born at Tschötsch, in the Tirol. After studying at Brixen, Salzburg, and Landshut, he was appointed to the chair of history and philology at Landshut. In 1831 he accompanied the Russian general Count Ostermann-Tolstoy in a journey to the East. On returning he resided with this nobleman until 1840 at Geneva, and in the course of the next eight years twice revisited the East. In 1848 he was appointed professor of history in the University of Munich, and for a short time he sat as a deputy in the Frankfort Parliament, but after 1850 he lived privately in Munich. Fallmerayer was a distinguished polyglot. His opinion concerning the Slavic origin of the modern Greeks and of their language excited a great controversy. His principal works are: *Geschichte des Kaisertums Trapezunt* (1831); *Geschichte der Halbinsel Morea im Mittelalter* (1830–36); *Fragmente aus dem Orient* (1845). His *Complete Works* were published in three volumes in Leipzig, 1861.

FALL OF THE HOUSE OF USHER, THE. A short story by Edgar Allan Poe, which appeared in the *Gentleman's Magazine* about 1840. One of the most noted of his tales, it is a gruesome mixture of madness, death, and ruin.

FAL'LON, MICHAEL FRANCIS (1867–). A Canadian Roman Catholic bishop. He was born in Kingston, was educated at the Christian Brothers' School and Collegiate Institute in that city, and afterward at Ottawa University, where he graduated in 1889. He also studied at the Gregorian University in Rome. On his return to Canada he became a member of the Oblat Order, and was for some time professor of English literature in Ottawa University, of which he was also vice rector for three years. In 1898–1901 he was rector of St. Joseph's Church, Ottawa, and in 1901–04 rector of the church of the Holy Angels, Buffalo, N. Y. From 1904 to 1909 he was provincial of the Oblat Order and in the latter year was appointed Bishop of London, Ontario.

FALLO'PIAN TUBES (so called after Fallopio (q.v.), who is usually, but incorrectly, regarded as their discoverer), or OVIDUCTS. Canals about 4 or 5 inches in length in the human body, opening at their inner extremity into the upper angle of the uterus, and at the other end, by a fringed funnel-shaped termination, into the cavity of the peritoneum. This fringed or fimbriated extremity at certain periods grasps the ovary and receives the ovum, which is discharged by the rupture of the Graafian vesicle. (See OVARY.) The ovum usually passes along the Fallopian tubes into the uterus, where it is either impregnated by contact with one or more spermatozoa, is absorbed, or escapes with the vaginal mucus. Sometimes, however, the ovum becomes not only impregnated, but retained and further developed, in the Fallopian tubes, thus giving rise to one of the forms of extra-uterine pregnancy.

FALLOPIO, fäl-lō'pē-ō, or **FALLO'PIUS**, GABRIELLO (c.1523–62). An Italian anatomist, born at or near Modena. If the date of birth assigned is correct, he was only 25 when he was promoted from the University of Ferrara to a professorship at Pisa, whence, after a few years, he was called to Padua, to succeed Vesalius (q.v.), who had been compelled by the Inquisition to resign his office. Tomassini states that Fallopius was born in 1490. He is classed, with Vesalius and Eustachio, as one of the founders of modern anatomy. He was succeeded by his favorite pupil, Fabricius ab Aquapendente.

He published numerous works in various departments of medicine, of which the most important is his *Observationes Anatomicæ, in Libros Quinque Digestæ* (1861), in which he corrects many errors into which his predecessor, Vesalius, had fallen. He was the first to describe with accuracy the ethmoid and sphenoid bones, and the minute structure of the ear (the canal along which the facial nerve passes, after leaving the auditory, is still known as the aqueduct of Fallopius), the muscles of the soft palate, and the villi and valvulæ conniventes of the small intestine. The tubes passing from the ovary on either side to the uterus which bear his name were known to and accurately described by Herophilus and Rufus of Ephesus, 300 years before our era; but Fallopius discovered their function. In addition to his anatomical fame, he had a considerable reputation as a botanist. He was the superintendent of the botanical garden at Padua; and a genus of plants, *Fallopia*, has been named after him. A complete edition of his works, in four folio volumes, was published in 1600.

FALLOUX, fȧ'lo͞o', Alfred Frédéric Pierre, Count de (1811–86). A French author and statesman, born at Angers, in the Department of Maine-et-Loire, of an ultraroyalist family. Falloux first drew attention to himself by two works characterized by admiration of the old Bourbon régime—*L'Histoire de Louis XVI* (Paris, 1840), and *L'Histoire de Saint-Pie V* (ib., 1844). He appeared in Paris as an orator and writer for the church and the Bourbon cause and was among the irreconcilables of the Right under the Orleanist monarchy. In the elections of 1846 he was chosen deputy for the Department of Maine-et-Loire. He followed the policy of a section of the clerical party in welcoming the republic after the revolution of 1848, and was elected to the constituent Assembly. He must be held responsible for the terrible "days of June," for he was the one who demanded the immediate dissolution of the national workshops. He advocated the dispatch of the papal relief expedition (1849) and, as a Minister of Instruction under Louis Napoleon, formulated the *loi falloux*, an educational law, greatly favoring the clergy. After the coup d'état he retired to his estates. He became an Academician in 1856. Between 1866 and 1870 he unsuccessfully sought to reënter politics. He made incessant war upon the Empire, especially after the Italian expedition of 1859, and played a leading rôle in the Catholic Liberal party which included Lacordaire, Montalembert, Dupanloup, and Prince Albert de Broglie. After the war with Germany his views became somewhat more liberal. He it was who proposed the fusion of Orleanist and Bourbon claims, thus gaining the distrust of the extreme Right. Furthermore, his liberal tendencies placed him at odds with the Ultramontanes, and he was almost excommunicated in 1876. Besides the works already mentioned, he wrote: *Le parti catholique* (Paris, 1856); *Souvenirs de charité* (ib., 1857); *Madame Swetchine, sa vie et ses œuvres* (ib., 1860); *La questione italienne* (ib., 1860); *Questions monarchiques* (ib., 1873); *Du Scepticisme politique* (ib., 1872); *De la contre Révolution* (ib., 1878); *De l'Unité nationale* (ib., 1880); *Etudes et Souvenirs* (ib., 1885). His memoirs were published under the title *Mémoires d'un royaliste* (ib., 1888). Consult Veuillot, *Le comte de Falloux et ses mémoires* (ib., 1888).

FAL'LOW (AS. *fealu*, yellow, Icel. *folr*, OHG. *falo*, Ger. *fahl;* connected with Lat. *pallidus*, pale, Gk. *πολιός*, *polios*, gray, Skt. *palita*, gray). Land allowed to rest without crops for a season, either tilled or untilled (*bare* or *black* fallow), or land on which an intercrop is grown to fit it for the main crop (*green* fallow). Fallowing is an agricultural practice of ancient origin. Wherever the system of bare fallowing, without manure, is practiced, it necessarily supposes that the soil is at least moderately fertile, for the practice is a species of soil robbery since its chief use is to liberate material from which plants may derive their food, and which is already stored up in the soil. It promotes weathering, which assists in rendering the mineral substances the soil contains more available. The plowing and stirring, by admitting air, promote decomposition, nitrification, and similar processes, which make both the organic and mineral constituents of the soil more available as plant food, and at the same time destroy insects and weeds that impoverish the soil and choke the crops. With improvements in the plow and other tillage implements and the rapid increase in use of manures and fertilizers during the last half century, the practice of fallowing has become less common than formerly. For summer fallow the land should be plowed deeply about the last of May, and the surface put in fine tilth. When the weeds spring up, they should be destroyed by surface tillage. If the land is to be seeded to wheat or rye, the last stirring of the soil should be given not later than the middle of August. The number of plowings and the amount of surface tillage required will depend upon a variety of conditions, but in some cases one deep plowing and one surface tillage will accomplish the desired purpose of destroying the weeds and preparing the soil for the succeeding crop by improving the tilth and increasing the supply of nitrates and other available plant food. For winter fallow, the land should receive a deep plowing in autumn. Exposure through the winter allows the frost to pulverize the surface. In the spring, when the weather becomes dry, the cultivator or the plow opens up the soil and destroys weeds. In many cases on poorer soils it is good practice to apply dung and similar organic manures to the fallow land.

Since the general introduction of green manuring crops, the term "fallow" has departed somewhat from its original meaning. These crops are sown on what was formerly the fallow and are styled fallow crops. This practice, known as green fallow, is especially applicable to light, poor soils. It protects the soil from washing and loss of nitrates by leaching, chokes out weeds, improves the tilth, and, if leguminous plants are grown, it enriches the soil in nitrogen gathered from the air by these plants, while some mineral matter is brought to the surface from the subsoil by the roots of the plants. (See Green Manuring.) In dry climates, however, green fallow land is likely to suffer from drought in autumn. In so-called "dry farming," practiced in regions of scanty rainfall, a grain crop is often grown only every second year, the land being kept in bare fallow and well stirred meanwhile to store and conserve moisture. Bastard fallowing is a term applied in Scotland to the practice of plowing hay stubble at the end of summer, freeing from weeds, and sowing with wheat in autumn. A similar practice, known as short fallow in America, consists in plowing the soil immediately after removing a crop of grain, clover, etc., and keeping the soil well stirred until grain or grass is seeded in the fall. This treatment is very beneficial, and the period is so short that there is not much danger of loss of nitrogen by leaching. Consult: Roberts, *The Fertility of the Land* (New York, 1897); Storer, *Agriculture* (7th ed., ib., 1897); Hopkins, *Soil Fertility and Permanent Agriculture* (ib., 1910); Agee, *Crops and Methods for Soil Improvement* (ib., 1912).

FALLOW DEER (so called from the dun yellow color). A species of deer (*Dama platyceros*, or *vulgaris*) commonly kept in parks, in most parts of Europe. It is a native of the countries around the Mediterranean and has been introduced by man into the northern parts of Europe, where it has run wild in some places; it is also wild in Spain, Sardinia, and the Greek islands. How far its geographic range extends eastward is not certainly known. It is represented in the sculptures of Nineveh, but these engravings were probably copied from a different species, the Persian fallow deer (*Cervus mesopotamicus*). Its introduction into Great Britain has been ascribed to James VI of Scotland, but it is known to have existed long before his time in Windsor Park. Hundreds of fallow deer now inhabit some of the English parks, where they generally receive some attention and supplies of fodder in winter.

In size the fallow deer is smaller than the stag or red deer, from which it also differs in its broadly palmated antlers, about 25 inches long, its longer tail, and its smoother and finer hair. A large buck will weigh 180 to 200 pounds and stands between 36 and 40 inches at the shoulder. The record antlers are 29.5 inches in length, with a spread of 28.5, and possess 14 points. In color it is generally yellowish brown in summer, darker, or even blackish brown, in winter; more or less spotted with pale spots, particularly in summer, and when young. In one variety the spots are very marked; but in another (especially preserved in Epping Forest, near London) they are not to be observed even in the young. The under parts, inside of the limbs, and interior surface of the tail are white, and a dark line passes along the back. When the fallow deer and red deer are kept in the same park, the herds seldom mingle, nor do hybrids occur. The fallow deer loves the woods. Its flesh is one of the most esteemed kinds of venison. The remains of nearly allied fossil species occur in some parts of Europe. Compare SIKA; and see DEER, and Plate of FALLOW DEER, MUSK, ETC.

FALLOWS, SAMUEL (1835–1922). An American educator and bishop of the Reformed Episcopal church. He was born at Pendleton, England, and went to America in 1848, graduated at the University of Wisconsin in 1859, was appointed professor and vice president of Galesville University, and entered the Methodist ministry. He served in the Civil War as chaplain, and in 1865 was breveted brigadier general of volunteers. From 1871 to 1874 he was State Superintendent of Public Instruction. He was president of Illinois Wesleyan University for a year, and in 1875, joining the Reformed Episcopal denomination, was made rector of St. Paul's, Chicago. In 1876 he was consecrated Bishop of the West and Northwest jurisdiction, and he was eight times Presiding Bishop of the General Council. He was chairman of the general committee on education of the World's Congresses at the Chicago Columbian Exposition. For several years he edited the *Appeal*, the organ of the Reformed Episcopal church in the West. He was interested in lexicography and in psychotherapy. He wrote: *Complete Handbook of Abbreviations and Contractions* (1884); *Handbook of Briticisms, Americanisms, Colloquial Words and Phrases* (1883); *Dictionary of Synonyms and Antonyms* (1883–86); *Progressive Supplemental Dictionary of the English Language* (1886); *Student's Biblical Dictionary* (1901); *Story of the American Flag* (1903); *Science of Health* (1904); *Popular Critical Biblical Encyclopedia* (3 vols., 1904); *Christian Philosophy* (1905); *Memory Culture* (1905); *Health and Happiness* (1908).

FALL RIVER. An important manufacturing city and port of entry in Bristol Co., Mass., 50 miles south by west of Boston, at the mouth of the Taunton River, and on the east shore of Mount Hope Bay (Map: Massachusetts, E 6). It is on the New York, New Haven & Hartford Railroad, and is connected by electric railways with cities and towns in the vicinity. Fall River has a safe and deep harbor. The port is among the first 20 of the United States in imports, and is exceeded only by New York and Philadelphia on the Atlantic Coast in intercoastal trade through the Panama Canal. The well known Fall River Line runs boats from here to New York, and connection is had with Philadelphia by the Merchants & Miners Line from Providence through connecting steamers. The city is about 9 miles long, covers 42 square miles and has many fine structures of native granite. The most notable buildings are the B. M. C. Durfee High School, a gift to the city, the Technical High School, public library, State armory, customshouse and post office, Bradford Durfee Textile School and Bristol Co. Court House. There are two high schools, two junior high schools and other elementary public schools, also a large number of parochial schools. A large proportion of both public and parochial schools are in fine modern buildings, as is the Bradford Durfee Textile School (opened in 1904). Among the charitable institutions are the Boys' Club, City, Union, St. Anne's and Truesdale Hospitals, Children's Home, St. Vincent's and St. Joseph's orphanages and several day nurseries. Five public parks have been laid out in various parts of the city and several playgrounds, and there are beautiful drives to the suburbs.

Fall River is one of the greatest textile manufacturing centres of the United States and is noted chiefly for its manufactures of cotton goods, employing 35,000 operatives in more than 100 mills which have nearly 4,000,000 spindles and represent an invested capital of $48,150,000. The largest fuel oil refinery in New England was erected here in 1922 having a capacity of a million barrels a month. Other manufactures include calico prints, bleaching, men's hats, yarn, thread, spools and bobbins, iron and brass foundry products, machinery, mops, rope and twine, etc. Granite quarrying is also an important industry which affords employment to a considerable number of men.

The government, under a charter granted in 1902, is vested in a mayor, chosen once in two years, and a board of aldermen consisting of 27 members. The school committee of nine members is chosen by popular election. The Mayor appoints superintendents of streets and public buildings, and nominates water, park and fire commissioners, assessors, tree warden, trustees of library, auditor and solicitor. These are all subject to the confirmation of the board of aldermen. This body elects the city clerk, treasurer and collector. The police commission is appointed by the Governor of the State. The mayor makes up the annual budget, subject to the approval of the board, which can decrease, but not increase, his estimates. Fall River has an excellent system of sewers, is lighted by gas and electricity and owns its water works, constructed at a cost of $2,000,000 which provides a never-failing supply of pure water from Watuppa Lake. The city receipts for 1924 were $12,651,309, expenditures $12,375,405. Fall River was the first city in the United States to adopt free text books in public schools. The city is noted for its law abiding character and general freedom from crime, especially among juveniles. Pop., 1850, 11.524; 1870, 26,766; 1890, 74,398; 1900, 104,863; 1910, 119,295; 1920, 120,485; 1925, 130,885.

Fall River was settled by grantees of the Plymouth Colony, along Mount Hope Bay upon land obtained by treaty with Massasoit, chief of the Wampanoags. Its inhabitants took a prominent part in the War of King Philip, and the territory long remained the hunting ground of the tribe. The village was included within the limits of Freetown until 1803, when it was incorporated as a separate town under its present name. It was called Troy from 1804 to 1834, when its old name was restored. In 1854 Fall River was chartered as a city, and 1862, on the readjustment of the Massachusetts-Rhode Island boundary, a part of the town of Tiverton, R. I. with a population of 3590, was annexed. On July 2, 1843, a disastrous fire destroyed 291 buildings and other property, a total loss of $525,000. Consult Earl, *A Centennial History of Fall River* (New York 1877); Fenner, *History of Fall River* (1906); *History of Fall River*, compiled for the Cotton Centennial (1911); Hutt, *History of Bristol County* (1924).

FALLS CITY. A city and the county seat of Richardson Co., Neb., 102 miles south by east of Omaha, on the Missouri Pacific and the Chicago, Burlington and Quincy railroads (Map: Nebraska, J 4). It has railroad shops, grain elevators, a poultry-packing plant, a large brewery, and manufactures of flour, cider, and vinegar, cigars, stock powder, and cement. The city contains a public library and Catholic convent. The water works and electric-light plant are owned by the municipality. Pop., 1900, 3022; 1910, 3255.

FAL'MOUTH. A municipal borough and seaport of Cornwall, England, on a west branch of the estuary of the Fal, 66 miles west-southwest of Plymouth (Map: England, A 6). It consists chiefly of a narrow street, a mile long, on the southwest of the harbor, and of beautiful suburban terraces and villas on the heights behind. The harbor, one of the best in England, whose advantages were first exploited by Sir Walter Raleigh, is formed by the estuary of the Fal. It is defended on the west by Pendennis Castle and on the east by St. Mawes Castle, both built in the reign of Henry VIII. The entrance is about 1 mile broad. The docks of Falmouth have an area of over 100 acres. At one time an important port for the foreign mail packets, the town is now chiefly known as a watering place, the bathing being excellent and the climate delightfully mild. A new pier, which cost $60,000, was completed in 1905, and there have been other important improvements along the water front in recent years. The municipality maintains a fine park, given by the Earl of Kimberley, and also landing piers, bathing beaches, and a free library. It controls the oyster and mussel fisheries. Falmouth is a busy centre of the pilchard fishery and has an export and import trade of increasing volume and importance. It exports arms and ammunition, chemical products, tin, copper, and clay. Its chief imports are grain, manures, and timber. It is the seat of a United States consul. The scenery of the Fal, from Truro to Falmouth, is of great beauty. Pop., 1901, 11,789; 1911, 13,136.

FALMOUTH. A city and the county seat of Pendleton Co., Ky., 59 miles by rail north by east of Lexington, on the Licking River, and on the Louisville and Nashville Railroad (Map: Kentucky, F 2). It is in an agricultural and dairying region, with a trade in tobacco, grain, and live stock, and has flour, lumber, and woolen mills, tobacco warehouses, a distillery, cannery, etc. The water works and electric-light plant are owned by the municipality. Pop., 1900, 1134; 1910, 1180.

FALMOUTH. A town, including several villages in Barnstable Co., Mass., 16 miles (by water) east of New Bedford, on Vineyard Sound and Buzzard's Bay, and on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, F 6). It has a public library and is a popular summer resort. At Woods Hole, a village of Falmouth, the Marine Biological School is situated. Falmouth was settled in 1636 and incorporated in 1686. The town owns the water-works system. Pop., 1900, 3500; 1910, 3144.

FALSE ACA'CIA. See LOCUST TREE.

FALSE BAY. An inlet on the southwest end of Cape Colony, South Africa, situated between the capes of Good Hope and Hangklip. It is almost circular in shape and over 22 miles in diameter, and, being remarkably well sheltered by Table Mountain from the northwest winds, is used as a station for the British naval forces in South Africa.

FALSE DECRETALS. See PSEUDO-ISIDORIAN DECRETALS.

FALSE FLAX. See CAMELINA; GOLD OF PLEASURE.

FALSE IMPRISONMENT. The wrongful violation of the right of personal liberty by detention or restraint of a person without authority of law. While ordinarily it takes the form of confinement in a prison, jail, or police station, actual incarceration is not necessary to the offense. Nor is assault or personal violence. It may be committed by words or gestures operating upon the will of a person, so that his liberty of action is illegally limited. A man may be falsely imprisoned in an open street, as when he is accosted by an officer and told that he is a prisoner. But an illegal interference with his right of passage along a highway does not amount to false imprisonment if he is free to proceed by some other way. The victim of false imprisonment may regain his liberty by a writ of habeas corpus (q.v.) and is entitled to damages in an action in tort from the wrongdoer, who is also liable to criminal prosecution by *indictment*.

The defendant, in a civil or criminal action for false imprisonment, must (after the plaintiff has made out a prima facie case) prove either that the imprisonment was not his act or that it was justified. He must do more than prove that he did not apply the restraint; he must show that he did not direct, instigate, authorize, or adopt the proceedings connected with the imprisonment. All persons taking part in a false imprisonment, whether as instigators, officers, or agents, are liable as joint wrongdoers. A person is not liable for false imprisonment who does no more than make a complaint to a magistrate or a police officer, if the judge or the policeman thereupon takes independent action.

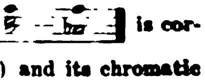
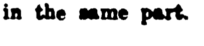
Whether a judicial officer is liable, civilly, for a false imprisonment which he has ordered, depends upon whether he has acted with or without jurisdiction. If he was absolutely without jurisdiction, he is liable; otherwise not, even though he may have acted maliciously. For the corrupt or malicious misconduct of an officer, when acting in a judicial capacity, the only punishment is impeachment or removal from office. An imprisonment by a sheriff, constable, policeman, or similar officer is justified: (1) when made under an apparently regular warrant issued by a judge having apparent jurisdiction of the matter; (2) when made without a judicial warrant, but upon reasonable suspicion of felony, even though a felony has not been committed, or of a person committing a breach of peace in the officer's presence. An imprisonment by a private citizen is justifiable at common law only when made of one committing a breach of the peace in his presence, or of one whom he has reasonable cause to believe guilty of a felony which has been actually committed. These rules of the common law have been modified by modern statutes in many jurisdictions. Consult Stephen, *History of the Criminal Law of England* (London, 1883), and the authorities referred to under Tort and Malicious Prosecution.

FALSEN, fäl'sen, Christian Magnus (1782–1830). A Norwegian statesman, jurist, and historian, son of Enevold de Falsen (1755–1808), a dramatist and author of a famous war song "Til vaaben." He was born at Oslo, near Christiania. In 1808 he became circuit judge at Follo, and after 1814 he played an important part in politics. He upheld King Christian Frederick, and after the separation of Norway from Denmark associated himself with J. G. Adler in drafting a constitution for Norway, which was modeled upon that adopted by France in 1791, and which was voted, May 17, 1814, by the Eidsvold, in which he and Sverdrup were leaders. In 1822 he was appointed Attorney-General of the Kingdom, and in that post, which he held for three years, lost much of his popularity with the Democratic party. In 1825 he became bailiff for Bergen, and in 1827 president of the Supreme Court. His principal work is *Norges Historie* (1823–24), a history of Norway to 1319 A.D. Consult the biographies by Daa (Christiania, 1860) and Vullum (ib., 1881).

FALSE POINT. A cape, harbor, and lighthouse in the Cuttack District of Bengal, India, on the Bay of Bengal (Map: India, E 4). The harbor is large but exposed, and loading can be carried on only in calm weather. It is a regular port of call for Anglo-Indian coasting steamers. There is a large export trade, chiefly in rice, with Ceylon, Mauritius, and other British colonies. It derives its name from frequently being mistaken for Point Palmyras, to the north.

FALSE POSITION, Rule of. An ancient mode of indirect reckoning, largely superseded by the direct method of equations. The simple equations found in the *Lilivati* of Bhaskara, in the *Liber Quadratorum* of Leonardo of Pisa (see Fibonacci), and in the works of Tartaglia are solved by this assumption. Indeed, the method goes back to the ancient Chinese and Egyptian mathematicians. The method consisted in assuming any number for the unknown quantity, testing its ability to satisfy the given conditions, and finally correcting it by means of a simple proportion; e.g., What number is that whose half exceeds its third by 12? Assume 96 to be the number; $48 - 32 = 16$, which is too great; but $16 : 12 = 96 : 72$, hence 72 is the number.

FALSE PRETENSES. In law, willful misrepresentations of fact, whereby a person is induced to part with money or other property to the person making the false statements or to another. By the common law of England a man is not punishable as a criminal who has induced another by fraudulent representations to part with money or goods, unless the loss occasioned by the deception be of a public nature. Larceny or theft was the only species of wrongful abstraction of articles of value which was recognized; and where the consent of the owner to the transaction was obtained, no matter how fraudulently, the loser was left to a civil action for deceit, or to an indictment for the crime of cheating. But neither of these remedies was of sufficient scope to cover all cases of the obtaining of money or other property by false pretenses, and accordingly a statute was passed in the thirty-third year of Henry VIII, whereby it was enacted that if any person should falsely and deceitfully obtain any money, goods, etc., by means of any false token or counterfeit letter made in any other man's name, the offender should suffer any punishment short of death, at the discretion of the judge. This statute, however, only reached the case of deception by use of a false writing or token; the Statute 30 Geo. II, c. 24, was therefore passed for the purpose of including all false pretenses whatsoever. Further alterations have been made by subsequent statutes. The general principle is that, wherever a person fraudulently represents as an *existing fact* that which is not an existing fact, and so obtains money or other property from the victim of the deception, he commits an offense within the act. A false representation as to the hopes or expectations of the person making them, as a deceitful calculation of anticipated profits, or the like, is not a violation of the law, however it may mislead the person to whom it is made. The provisions of the Statute of Geo. II have been substantially adopted in the legislation on this subject in our States. See Cheat; Fraud; Larceny; and consult the authorities referred to under Criminal Law.

FALSE RELATION. In music, the discrepancy arising from the use in successive chords, but in different parts, of any given tone and one of its chromatic derivatives. Thus,  is a false relation, but  is correct, since the given tone (a) and its chromatic derivative (a♭) are in the same part.

FALSE SWEARING. See Perjury.

FALSET, or **FALSETTO.** See Voice.

FALSE TOPAZ. See Quartz.

FALSE VERDICT. See Jury.

FALSE WEIGHTS AND MEASURES. See Weights and Measures.

FALSTAFF. An opera by Verdi (q.v.) first produced in Milan, Feb. 9, 1893; in the United States, Feb. 4, 1895 (New York).

FALSTAFF, fạl′stăf, Sir John. A fat, cowardly, boastful character, unsurpassed in literature as a comic portrait. He is represented by Shakespeare in *The Merry Wives of Windsor* as the lover and dupe of Mistress Page; in *Henry IV* as a soldier and man of wit. It has been supposed that the character was intended to ridicule an English general, Sir John Fastolfe, who at Patay fled before Joan of Arc and was degraded in consequence. In the first draft of *Henry IV* Falstaff is called Sir John Oldcastle, the name of a prominent Wiclifite, Lord Cobham, who was put to death under Henry V, the name being subsequently changed in deference to Oldcastle's descendants. The character has also been made the central figure of operas by Dittersdorf (1796), Salieri (1796), Balfe (1838), Nicolai (1849), Adam (1856), Verdi (1892), and others.

FALSTER, făl′stẽr. A Danish island in the Baltic Sea, lying to the south of Zealand, from which it is separated by Masned Sound, and east of Laaland, from which the narrow Guldborg Sound divides it (Map: Denmark, E 4). Area, 183 square miles. Its surface is flat, nowhere exceeding an altitude of 150 feet. It is very fruitful and well cultivated, though the low districts are swampy and unhealthful. The inhabitants are chiefly engaged in agriculture, stock farming, and dairying. Cultivation of the sugar beet is an important industry. The chief towns are Nykjöbing, on the Guldborg Sound, and Stubbekjöbing. Pop., 1901, 34,422; 1911, 37,460.

FALSTER, Christian (1690–1752). A Danish poet and philologist, born at Branderslev (island of Laaland). He became rector of the school at Ribe in 1712, and, although offered better positions from time to time, refused to give up his rectorship, preferring to live there for his special studies. He published translations of *Ovid* (1719) and *Juvenal* (1731); 11 original satires on his times, often reprinted (1720–39); and in Latin a number of works, such as *Vigilia Prima Noctium Ripensium* (1721); *Memoriæ Obscuræ* (1722); *Amœnitates Philologicæ* (3 vols., 1721–32).

FALUN, fä′lŭn. A town of Sweden, in the Läṇ of Kopparberg, situated on the Faluå near the north end of Lake Runn (Map: Sweden, F 6). The city consists of nine ancient villages, and is now regularly built, but is dirty, owing to the adjacent smelting works. The principal buildings are the Kopparbergs Kyrka—dating from the fourteenth century—with its green copper roof, a town hall, a museum, a gymnasium, and a mining school. To the southeast of the city are situated the famous copper mines of Falun, which were at one time classed among the richest in the world. The machinery is run by water power. Much attention is paid to the production of vitriol. Silver, sulphur, and gold are also obtained; manufactured products include linen, cotton goods, tablecloths, leather, and smoking pipes. Pop., 1900, 9606; 1910, 11,582; 1912, 11,955.

FA′MA (Lat.). A personification of Rumor, by the Roman poets. Vergil gives a vivid description of Fama (*Æneid*, iv, 173 ff.), and Ovid describes her palace of bronze (*Metamorphoses*, xii, 39 ff.). See Ossa.

FAMAGUSTA, fä′mȧ-gōō′stȧ, or **FAMAGOSTA.** A seaport on the east coast of Cyprus. It has a fine mosque, formerly a Christian church, while to the north are the ruins of Salamis. Its harbor has been improved under English rule. Pop., 1901, 3825; including the adjacent village of Varashia, 5327. Famagusta was built by the Romans of the Empire, probably on the site of the ancient Arsinoë, and was called Fama Augusta. Under Byzantine rule it was an episcopal see and from the twelfth century was the richest city on the island. The Genoese and Venetians held it in turn, the latter building its strong fortifications. In 1517 it fell into the hands of Turkey.

FAMILIAR′ITY (Lat. *familiaritas,* from *familiaris,* familiar, from *familia,* family, from *famulus,* OLat. *famul,* servant). The traditional view of the process of recognition (q.v.) is rather an expression of a logical postulate than of a psychological analysis of the data furnished by consciousness. It has been assumed that recognition is possible only when the given experience is compared with the memory image of its former occurrence (called forth according to the laws of the association of ideas), and the judgment, "this is like to that," has been passed. But in most of our recognitions this lengthy process of comparison is not performed. On the contrary, recognition is usually "immediate," i.e., the object is at once "felt" to be familiar or known, there being present no associative links to "mediate" the judgment. Admitting this immediacy of recognition, the analytical psychologist seeks to discover whether the "feeling of recognition," the sudden glow of familiarity, can be subjected to further analysis, and whether its physiological substrate can be ascertained.

Four views with regard to the essential nature of the processes involved in recognition may be distinguished. 1. Familiarity is a "form of combination," in which the various constituents are fused together in such a way as to form a new mental process, an unanalyzable "knownness." 2. Immediate recognition, though it shows no conscious trace of the processes of association and comparison, is yet in reality complex, because based upon a subliminal association, i.e., an association in which the secondary member is not represented in consciousness. 3. Mental images need not necessarily be present; the actual basis of familiarity is to be found, partly in the especial effectiveness of familiar impressions or memory images for central excitation, and partly in the characteristic mood which they ordinarily induce, and which includes both pleasurable affective processes and the corresponding organic sensations. 4. Lastly, it is held that the essential factor in recognition is a feeling, the "feeling of familiarity"; whenever this appears, we recognize; when it does not appear, we fail to recognize. The sensations and ideas which result from the associative and organic reaction to the stimulus then serve to make the recognition definite—to name, place, and date the experience.

The evidence of experiment favors the last of these views. As against the first, observers unite in agreeing that the feeling of familiarity is analyzable; as against the second and third views; it has been shown that recognition is possible in the absence of any associated idea whatever, and that a perception may call up objectively correct associates and still not be recognized. It is more difficult to say whether the assumed organic complexes enter into the process of recognizing, because they must blend with the organic complexes comprised in the feeling of familiarity. So far as it goes, the evidence is also against them; recognition, as such, seems to be wholly a matter of the feeling. This feeling itself is variously reported as a glow of warmth, a sense of ownership, a feeling of intimacy, a sense of being at home, a feeling of ease, a comfortable feeling. It is a feeling in the narrower sense, i.e., a simple connection of affection and sensation in which the affective element predominates, pleasurable in its affective quality, diffusely organic in its sensory character. That is all that analysis can, at present, tell us about it. If we allow ourselves to speculate, we may go further and find a genetic sanction for its peculiar warmth and wide diffusion; we may suppose that it is a weakened survival of the emotion of relief, of fear unfulfilled. To an animal so defenseless as was primitive man, the strange must always have been cause for anxiety; "fear" is, by its etymology, the emotion of the "farer," of the traveler away from home. The bodily attitude which expresses recognition is, on this view, still the attitude of relief from tension, of ease and confidence. Consult: Baldwin, *Mental Development in the Child and the Race* (New York, 1906); Höffding, in *Vierteljahrsschrift für wissenschaftliche Philosophie*, vols. xiii, xiv (Leipzig, 1889-90); Külpe, *Outlines of Psychology* (London, 1909); Titchener, *Text-Book of Psychology* (New York, 1910).

FAMIL'IAR SPIRITS. Spirits supposed to attend certain individuals. See WITCHCRAFT.

FAM'ILISTS, FAMILY OF LOVE. See AGAPEMONE.

FAM'ILY (Lat. *familia*, family). The Romans used the word to denote personal property and, further, to denote the descendants of a common progenitor. In our use the word has this last meaning and also the more especial reference to the group—father, mother, and children. The prevailing idea has long been that the monogamic family was the original type, and that on this all society has been based, other forms being regarded as degenerate. This conception has been accepted since Aristotle, who wrote (*Politics*, i, 1) that the original family consisted of the husband and wife and the ox, which last is the slave of the poor man. This patriarchal family was the simplest and earliest form of government and became the model of the monarchy later, the sons with their families standing in coördinate relation to each other under the headship of the father. In Rome the idea of the family was closely connected with the state, and the inherent power of the father (*patria potestas*) was the basis of the social and political life. This conception of the family has been called in question in recent years by the investigations of Bachofen, McLennan, Morgan, and their followers. They find evidence that primitive man lived in a condition of promiscuity. Westermarck, Maine, and others deny this. The question is not yet decided. Far too little is known of primitive conditions to make a decision possible. Investigations have shown, however, that among many nations the family, in our sense of the word, can scarcely be said to have existed. Further, many historical nations have legends of the creation of the family. Among advanced nations are customs which seem to point to earlier conditions. The present indications are that monogamy must be considered as the highest form of the family the human race has yet attained. No people is definitely known to have lived entirely on a basis of promiscuity, though some have closely approached it. There are, however, at least three types of families which are distinct. The lowest of these is where the wife is at the head. (See MATRIARCHATE.) Polyandry is common, and descent is reckoned only through the mother. The father is frequently kept at a distance, and sometimes is not even regarded as a blood relative of his own children. A higher form is the patriarchal family, which is almost universally accompanied by polygamy. (See PATRIARCHATE.) This form has been widely extended and prevails to-day over large sections of the earth. The third form is monogamy.

The life of the monogamic family centres about the home, which has become a social and religious ideal. Under Christian influence the monogamic family attained a development and importance which it never enjoyed among pagan peoples. This development was gradual, as Christianity gained its footing among the converted nations. The spiritual emphasis which Christianity placed upon the connubial relations with the strict obligation of mutual fidelity contributed to this elevation of family life. The home has continued to gain in popular esteem. Its influence in elevating woman, in establishing chastity, in training children, in promoting religion, has given it deserved prominence. Modern charitable efforts seek to further home life. That the home is the best place for the child has become axiomatic. It is this conception of home which has given the modern family such superiority over all others. In industrial relations the family has been important. Until recent times it has been the unit of production. Though modern industrialism appears to have changed this, the agricultural pursuits remain in the hands of the family. The family has also been a unit of consumption. Economic changes have always had a great, if not a determining, effect upon the family. The change from rural to urban conditions has caused great disturbances, and the family is not yet adjusted to the new conditions. Consult: Letourneau, *Evolution of Marriage and of the Family* (New York, 1891); Westermarck, *The History of Human Marriage* (London, 1894); Starcke, *The Primitive Family* (New York, 1899); Howard, *History of Matrimonial Institutions* (Chicago, 1904); Arbois de Jubainville, *La famille celtique* (Paris, 1905); Lévy, *La famille dans l'antiquité israélite* (ib., 1905); Parsons, *The Family* (New York, 1906); Bosanquet, *The Family* (London, 1906); Whetham, *The Family and the Nation* (ib., 1909); Dealey, *The Family in its Sociological Aspects* (Boston, 1912); Thwing, *The Family* (ib., 1913). See MARRIAGE.

FAMILY COMPACT (Fr. *pacte de famille*). The name given to two alliances between the French and Spanish branches of the house of Bourbon in 1733 and 1761, for mutual support against England. In the latter compact the Bourbons of Italy were included.

FAM'INE (OF., Fr. *famine*, from Lat. *fames*, hunger). A general scarcity of food, due as a rule to the failure of crops and marked by outbreaks of plague and an abnormal rate of mortality. In earlier history it seems to have played a larger part in the woes of mankind than at the present time, though it has not yet been wholly obliterated. The isolation of communities in the early days transformed a temporary local failure of crops into a serious famine. In earlier ages it was not infrequently the case that the inhabitants of one district were gorged with plenty, while those of the neighboring region were suffering from starvation. As time has progressed, famines have lost in intensity. This is due principally to the more efficient means of transportation, which permit the distribution of food with greater rapidity than in earlier days. America can now come by direct exportation of food, if need be, to the relief of suffering India. The diversification of industry has been another factor of importance in almost abolishing famines from the more highly developed countries. In such a system of diversified industry many interests are represented, and, while calamity may overtake one or two of them, it is not probable that all will be stricken at the same time. It is therefore only the poorer agricultural countries such as Ireland and India, and Eastern countries generally, where the population often depends upon a single staple crop, that have been visited by famines in the latter part of the nineteenth century.

FAMINTZIN, fă-mĕn′tsĕn, Andrei Sergeyevitch (1835–). A Russian botanist. He was born at Sokolniki, studied at the University of St. Petersburg, and was appointed professor of botany there in 1872. He was one of the earliest investigators of the development of the embryos of seed plants. His account of the embryo of *Alisma* (1879), along with that by Hanstein (1870), has long been taken as typical of the monocotyledonous embryo. His writings, many of which appeared in the publications of the St. Petersburg Academy, include *Embryologische Studien* (1879), *Studies of Crystals and Crystallite* (1884), and *Uebersicht über die Leistungen auf dem Gebiet der Botanik in Russland* (1892–94).

FAN. A tribe in French Equatorial Africa, differing in color and other bodily characteristics from the true negroes, well known through the explorations of Du Chaillu. They number about 300,000 and have only recently intruded themselves into the Gabun-Ogowé region, pushing forward to the coast from the northeast. The Yaunde of German Kamerun are related to them, but the Mpongwe, with whom they are often confused, are not. They are coffee-colored, well built, tall and slim, and have rather thin lips, well-developed beard, and short skulls, the frontal bone protruding. Their language is said to belong to the great Bantu family. They are serious and intelligent and to be depended upon. Their cannibalism has been greatly exaggerated. In the northern part of their territory it is not practiced at all, in the central region only by way of devouring an enemy's flesh, and even in the south not to any great extent. Consult Tessmann, *Die Pangwe* (2 vols., Berlin, 1913–14).

FAN (from AS. *fann* and cognate with Lat. *vannus*, both from the same ultimate root as wind, winnow, and Lat. *ventus*, from which Fr. *éventail*). An instrument or machine for agitating the air to winnow grain, ventilate rooms, or cool the body. In the East the use of fans is of remote antiquity. The Hebrews, Egyptians, Chinese, and the miscellaneous population of India,. all used fans as far back as history reaches. At the present day it is customary, in the better classes of houses in India, to suspend a large species of fan, known as a punkah, from the ceiling and keep it in agitation with strings, pulled by servants, in order to give a degree of coolness to the air. Among the oldest notices of winnowing fans are those in the Scriptures. There the fan is always spoken of as an instrument for driving away chaff or for cleansing in a metaphorical sense; and such notices remind us of the simple processes of husbandry employed by a people little advanced in the arts. As can be seen from the collection of Egyptian antiquities in the British Museum, the fan as an article of taste and luxury is of quite as old date as the agricultural instrument. On one of the bas-reliefs Sennacherib is shown attended by ladies carrying feather fans. In the Boulak Museum there is a wooden fan handle with holes for feathers, dating from the seventeenth century B.C.

References to the feather fan are numerous in ancient Greek authors, and illustrations of it are common on vases. Roman authors refer to it as used to drive away flies, notably Martial, xiv, 67. The vestal virgins employed fans to quicken the sacrificial flame. In the liturgy of the early Christian Church two deacons stood beside the altar and with fans (*flabella*) of thin parchment or peacock feathers or fine linen kept flies away from the sacred vessels. Gradually the waving of the flabellum acquired a deeper meaning and was held to signify the wafting of divine influence upon the ceremony, the movements to and fro symbolizing the quivering of the wings of the seraphim. By the end of the sixteenth century this liturgical use of the fan had ceased, although large flabella of peacock's feathers are still carried at festivals in procession before the Pope, and to deacons of the Greek church at ordination a fan is delivered as the symbol of the sacred office.

The oldest existing Christian fan, and the most famous of the few of which we have any record during the Middle Ages, is preserved in the cathedral of Monza, near Milan. It dates from probably the sixth century, opens into a circle 10 inches in diameter, is made of purple vellum, has a Latin inscription on each side, and when touched by maidens who make pilgrimages to Monza for the purpose is believed to promote their marriage projects.

Flag-shaped fans were introduced into western Europe by the returning Crusaders and were much used in Italy. In the sixteenth century the Chinese folding fan arrived in Portugal from the Far East, and its development in the homes of European artists marks a new epoch.

Queen Elizabeth was especially fond of fans, both feather and folding, and examples of both appear in her numerous portraits. In her inventory of 1600 are no less than 27. In Italy was developed a regular code of the fan, according to which ladies were supposed to convey hints and signals to admirers and to rivals. The poets took it up, and Gay tells how Master Cupid planned the shape of the fan, converted his arrows into sticks, and from their barbed points, softened by love's flame, forged the pin. According to a Spanish version, the first fan was a wing that Cupid tore from the back of Zephyrus, with which to fan Psyche as she slept upon her couch of roses. Even the Greeks placed the plumed fan in the hands of the love god, thus recognizing it as his peculiar sceptre. "Women," says the *Spectator*, "are armed with fans as men with swords,—and sometimes do more execution with them." "In Spain," writes Disraeli in his *Contarini Fleming*, "the fan speaks a particular language, and gallantry requires no other mode to express its most subtle conceits, or its most unreasonable demands, than this delicate machine."

In the seventeenth century the centre of the European manufacture of fans was Paris, where the frames were shaped out of wood or ivory and the decorations painted on thin but tough vellum. Many were exported to Spain, some painted in Spanish style, and some blank to be painted in Spain. A famous fan painter of the period was Rosalba Carriera, and the designs of Lebrun and Romanelli were in high favor. Fans from India were imported into both France and England. In the reign of Louis XV the importation of Indian and Chinese fans increased greatly, following the fashion that favored Oriental decorative art in all its forms. But the home manufacture from exquisitely carved mother-of-pearl and ivory, with painted scenes after Boucher, Watteau, and Lancret, continued important, and the fan styles of France were copied more or less closely in Italy, England, and Spain. For parchment, taffeta, satin, and plain silk were often substituted, and occasionally lace. The French Revolution put an end to elegance in fans as well as in most of the other decorative arts. The collection of fans in the Victoria and Albert Museum at South Kensington is of extraordinary importance, and the fan exhibition there in 1870 helped revive the industry not only in England but also on the Continent.

Bibliography. *Catalogue of the Loan Exhibition of Fans at South Kensington* (London, 1870); Blondel, *Histoire des éventails* (Paris, 1875); Salwey, *Fans of Japan* (London, 1894); Rhead, *History of the Fan* (ib., 1910).

FAN, or FANNING MILL. In agriculture, a machine employed to winnow grain. In passing through the machine the grain is rapidly agitated in sieves, and, falling through a strong current of air created by a rotary fan, the chaff is blown out, and the clean grain falls out through an opening beneath. Fans are operated by hand or other power. A fan is a constituent part of large modern threshing machines, the threshing and preliminary winnowing being thus accomplished in one operation. The fan superseded the old and slow process of winnowing, which consisted in throwing the grain into the air or pouring it from a height, while a current of wind, blowing across the threshing floor, carried away the chaff. It is said that a machine for winnowing grain was first made in Scotland, by Andrew Rodger, a farmer of Roxburghshire, in the year 1737. See IMPLEMENTS, AGRICULTURAL.

FANA'RIOTS. To the Greeks who assisted him in obtaining an entrance to Constantinople after his ships had been transported overland to the Golden Horn, Mohammed II granted the Fanar quarter of the city, on the Golden Horn adjoining the Blacherne. The district was so called from the lighthouse that stood on the promontory jutting from it into the Golden Horn. The district is described by Grosvenor as "prosperous, cleanly, and well-kept," and Theophile Gautier says of it, "Hither has fled ancient Byzantium." Its Greek inhabitants, many of them descendants of the oldest and noblest Byzantine families, were known as Fanariots and came to be a special class in the Ottoman Empire, recruited by emigrants from different parts of the old Byzantine Empire. Subtle, insinuating, intriguing, they soon took advantage of the ignorance of the Turkish governors and made themselves politically indispensable to their rulers. They filled the offices of dragomans, secretaries, bankers, etc. Through their influence the lucrative office of dragoman of the fleet was called into existence, which gave them almost unlimited power in the islands of the Archipelago. From them were chosen, until the outbreak of the revolution in 1821, the hospodars of Wallachia and Moldavia, while in addition the disposal of most of the civil and military posts under the Turkish government was in their hands. In spite of their power, however, they never exhibited much patriotism; they were animated by the petty motives of a caste, and when the War of Liberation broke out among their countrymen, the part they took in it, though fairly important, was not what their station and their wealth should have contributed to the patriot cause. In the present altered state of affairs in Turkey they have no political influence. Consult: Tennent, *History of Modern Greece* (2 vols., London, 1845); Samuelson, *Roumania* (ib., 1882); Crusius, *Turcogræcia*, pp. 91, 479 (*Basileæ*, 1854); Eaton, *Survey*, etc., pp. 331 et seq. (London, 1798); Dallaway, *Constantinople, Ancient and Modern*, pp. 98 et seq. (ib., 1797); *Livre d'or de la noblesse Phanariote en Grece, en Roumania, en Russie, et en Turquie, par un Phanariote* (Athens, 1892).

FAN-CHENG, făn'chŭng', or **FAN-CHING.** A town in the Province of Hu-peh, China, situated on the Hankiang, 162 miles northwest of Hankow. With its twin city of Siangyang-fu across the river it forms an important commercial centre on account of its position on the trade routes between southern and northern China, and the commerce from the plains of Honan and the Hoang Ho basin. The population is estimated at 100,000.

FANCIULLA DEL WEST, făn'chē-ōō'lȧ dĕl vĕst', LA. ("The Girl of the Golden West.") An opera by Puccini (q.v.), first produced in New York, Dec. 10, 1910; in Italy, June 12, 1911 (Rome).

FAN CORAL. A flat, spreading coralline growth, usually one of the Alcyonaria (q.v.).

FANDANGO, *Sp. pron.* făn-däŋ'gō (Sp., from the African name). One of the three national dances of Spain, the others being the bolero (q.v.) and the seguidilla (q.v.). It is probably the oldest Spanish dance and the prototype of all the other forms. It is mentioned frequently in the literature of the sixteenth century, when it seems to have first attained a national importance. The time of the dance is $\frac{3}{4}$, but the figures are very lively, and the music is supplied by castanets in the hands of the performers, a man and a woman, and by a song which is accompanied on the guitar. Sometimes the music is stopped, whereupon the dancers also stop, and remain rigid until it is resumed. When one couple is tired, another immediately takes its place, and the music and the dance go on as before, with no interruption.

FANEUIL, făn'el *or* fŭn'el, PETER (1700–43). An American merchant, born in New Rochelle, N. Y. The family removed to Boston shortly after his birth and there established an extensive mercantile business, of which in time he became the proprietor. In 1740 Peter Faneuil constructed Faneuil Hall (q.v.) at his own expense and presented it to the town. The building was completed in the fall of 1742, the first public use to which it was put being the memorial exercise to its donor, who died in May, 1743.

FANEUIL HALL, făn'el *or* făn'yel. A market house and public hall in Boston, Mass. The original building, begun in 1740 and completed in 1742, was erected by Peter Faneuil (q.v.) and presented by him to the town. It was almost completely destroyed in 1761 and in 1763 was rebuilt by the town. During and preceding the Revolution it was so frequently used for important political meetings that it became known as The Cradle of American Liberty. In 1805 it was enlarged to its present size, 80 by 100 feet, and an additional story was added. The hall contains some fine paintings, the most celebrated of which is "Webster Replying to Hayne," by Healy, and meetings are still held in it. The basement is still used as a market. Consult Brown, *Faneuil Hall and Market* (Boston. 1901). See Plate of BOSTON.

FAN'FARE (Fr., from Sp. *fanfárria*, brag, from OSp. *fanfa*, bluster; probably from Ar. *farfâr*, blustering, from *farfara*, to agitate). A trumpet signal which employs the tones of the triad and generally closes on the dominant. It is often used to introduce marches (*Tannhäuser*, *Atalie*, etc.). Famous fanfares are, that in Beethoven's *Fidelio* announcing the arrival of the Governor and ending on the tonic, and the more extended ones in Wagner's *Lohengrin*, *Tristan*, and *Meistersinger*.

FAN'NIN, JAMES W. (c.1800–36). An American soldier. He was born in Georgia, and removed to Texas in 1834. In the Texan War of Independence he raised a company known as the Brazos Volunteers, which formed part of General Austin's army. After the fall of the Alamo Fannin received orders from Houston to blow up the fort at Goliad and fall back to Victoria. He delayed his retreat for some time to hear from Captain King, whom he had sent out to collect the women and children of the neighborhood, and finally setting out 350 strong, was overtaken and attacked, on March 19, 1836, on the banks of Coleto Creek, by General Urrea and 1200 Mexican troops. After a two days' battle, in which the Mexicans lost between 300 and 400 in killed and wounded, and the Texans only about 70, Fannin surrendered, on the condition that his troops should be paroled. Instead of being freed, they were taken back to Goliad as prisoners, where, on March 27, in accordance with orders from Santa Anna, in the absence of General Urrea, they were all shot down in cold blood, with the exception of two surgeons, the women, and about 25 men who escaped after being fired on. Those put to death numbered 371 and included Lieutenant-Colonel Ward's men.

FAN'NING, EDMUND (1737–1818). An American soldier, known as a partisan leader on the side of the Loyalists during the Revolutionary War. He was born on Long Island, N. Y., graduated at Yale in 1757, and soon afterward removed to Hillsboro, N. C., where he practiced law, held various positions of minor importance, and was elected to the Legislature of the Colony. As recorder of deeds for Orange County, he made himself exceedingly unpopular with the colonists, and was charged with having, by his abuses and his vicious administration, done much to cause the uprising of the Regulators, who virtually drove him from North Carolina. He acted for a time as private secretary to his father-in-law, Governor Tryon (q.v.), in New York, and in 1774 was appointed surveyor-general by the British government. In 1777 he organized in New York a corps of 460 Loyalists, which, under the name "Associated Loyalists," or the "King's American Regiment," took an active part in the partisan warfare in the Northern Department. A short time before the close of the war he fled to Nova Scotia, where in 1783 he became a councilor and Lieutenant Governor, and subsequently was Governor of Prince Edward Island from 1786 to 1805. By successive promotions he became a lieutenant general in the British army in 1799 and a general in 1808. He moved to London in 1814–15, where he lived till his death.

FANNING, JOHN THOMAS (1837–1911). An American civil and hydraulic engineer. He was born at Norwich, Conn., was educated in public and normal schools, studied engineering and architecture, and had begun to practice engineering in his native town when the Civil War broke out. He enlisted and attained the rank of lieutenant colonel. At the close of the war he resumed engineering practice in Norwich and soon began to specialize in hydraulics. During the next 10 years he was engineer for a number of municipal water works in New England. In 1877 he published *A Treatise on Hydraulic and Water Supply Engineering* which, as the first and for many years the leading American work on that subject, went through many editions and gave the author much prestige. At that time less than 500 cities in the United States had water works. He was subsequently employed as consulting engineer for many water-works plants, municipal and private. In 1885 he made a report on the improvement of water power on the Mississippi River at Minneapolis, Minn., and in the following year he was appointed chief engineer of the St. Anthony Falls Water-Power Company in that city, where he lived until his death. He prepared a comprehensive plan for the drainage of 3000 square miles of the hard-wheat land in the valley of the Red River of the North; was consulting engineer for many large water-power projects, among which were early plants on the Missouri River, at Great Falls and Helena, Mont., and on the Spokane River, at Spokane, Wash.; and was also associated as consulting engineer with several of the leading railroad companies of the West. A notable trait of Mr. Fanning's character was the friendly advice and assistance which he rendered to his fellow engineers throughout his long professional career. He was for 38 years a member, and in 1910–11 a vice president, of the American Society of Civil Engineers and contributed largely to its *Transactions*, but as a writer he was best known for the pioneer American treatise already mentioned.

FAN'NING ISLANDS (named from Edmund Fanning, who discovered the islands in 1798). A group of small islands in the Pacific, scattered about a segment of the equator, lying between long. 157° and 163° W. (Map: World, Western Hemisphere, J 5). The area of the group is about 260 square miles, and the chief islands are Christmas, Fanning, Jarvis, Washington, and Palmyra. Since 1888 they have belonged to Great Britain, but to Palmyra Island former Hawaiian now American claims have not yet been extinguished. Pop. (est.), 200.

FAN'NIUS STRABO, Gaius. A Roman historian and orator, introduced by Cicero as one of the speakers in his works *De Amicitia* and *De Republica*. He was a son-in-law of Lælius. During the third Punic War he served in Africa under Scipio Africanus (149–146 B.C.), and, according to his own statement, as preserved by Plutarch (*Tib. Gracch.*, 4), was one of the first to mount the walls of Carthage in the capture of that city. He fought in Spain in 142–141 and was consul in 122. He owed his celebrity in literature chiefly to his *History*, which treated contemporary events and was one of the earliest histories written in Latin; it was long famous for its style and its impartiality. Cicero mentions an abridgment of it by M. Brutus. For the extant fragments, consult: Peter, *Historicorum Romanorum Reliquiæ*, vol. i (Leipzig, 1870), and *Historicorum Romanorum Fragmenta* (ib., 1883); Gerlach, *Geschichtschreiber der Römer* (Stuttgart, 1855); Hirschfeld, "Die Annales des Cicero Fannius," in *Wiener Studien* (Vienna, 1879); Schanz, *Geschichte der römischen Litteratur*, vol. i, § 71, 6 (3d ed., Munich, 1907). This Fannius is frequently confounded with C. Fannius Strabo, who was consul in 122 B.C.

FANO, fä'nô (Lat. *Fanum Fortunæ*, from the temple of Fortune erected here by the Romans to commemorate the defeat of Hasdrubal, q.v.). An episcopal city in the Province of Pesaro and Urbino, Italy, on the Adriatic, 29 miles northwest of Ancona (Map: Italy, H 4). A modern statue of Fortune on the public fountain indicates the origin of the name. The once famous harbor is now choked with mud and sand, and the shipping is conducted through a canal leading from the Metauro to the Adriatic. The cathedral of San Fortunato has a thirteenth-century portal, a chapel with frescoes by Domenichino, and a Madonna with two saints by Carracci. In other churches are an enthroned Madonna (1497) by Perugino; a Madonna by Giovanni Santi, father of Raphael; an Annunciation by Guido Reni; frescoes by Viviani; and "Sant' Angelo Custode," by Guercino, which is the subject of Robert Browning's "The Guardian Angel." The Arch of Augustus has a second story, added during the fourth century in honor of Constantine. Fano has a lyceum, a gymnasium, an orphan asylum, an industrial school, and a once famous theatre, and is a centre of silk and fishing industries; makes oil and hemp goods. Sea bathing is excellent. Clement VIII was born here in 1536, and in 1514 the first printing press with Arabic type was set up here at the cost of Julius II. Pop., 1901 (commune), 24,848; 1911, 26,928.

FAN PALM. A loose term applied to certain species of palm, distinguished from the pinnate-leaved species, such as the date (*Phœnix*), by having fanlike leaves. Among the commoner fan palms are various species of *Corypha*, *Chamærops*, *Sabal*, and *Trachycarpus*. See Plate of Palmettos.

FANSAGA, fän-sä'gä, Cosimo (1591–1678). An Italian architect, painter, and sculptor, born at Bergamo. He was the pupil of Pietro Bernini in Rome and lived chiefly in Naples. His numerous works in that city include the fountain of Medina, the cloister and refectory of San Severino, the façade of Santa Teresa delli Scalzi and of St. Francis Xavier, the church of Santa Maria Maggiore, and the Maddaloni Palace, now the Banca Nazionale. Many of these were decorated with paintings and sculptures by his own hand. Despite their overloading of ornament and bizarre combinations, his works are usually effective.

FAN'SHAWE. A novel by Nathaniel Hawthorne, the author's maiden effort, published anonymously in 1826 at his own expense.

FANSHAWE, Sir Richard (1608–66). An English diplomat and author, born in Hertfordshire. He entered Jesus College, Cambridge, and in 1626 began the study of law in the Inner Temple. He spent several years upon the Continent and in 1635 began his diplomatic career, accompanying Lord Aston, the English Ambassador, to Spain as his secretary. He was a zealous Royalist and joined the army of Charles I early in the Civil War. In 1648 he became treasurer of the navy under Prince Rupert and afterward joined Prince Charles in Holland. He was special envoy to the King of Spain in 1650, for the purpose of obtaining pecuniary aid for the royal cause, but his mission was unsuccessful. He followed Prince Charles to Scotland as his secretary and was taken prisoner at the battle of Worcester (Sept. 3, 1651). He was released on parole and remained in England until 1658, when he again joined Charles II on the Continent, returning with him at the Restoration. In 1662 he was made Minister to Portugal and in 1663 was transferred to Madrid, where he died soon after he had been recalled in 1666.

The literary work of Fanshawe consists largely of translations and poetry. Probably his best-known work is *The Pastor Fido* (1647), a translation from the Italian of Guarini. His other translations include Vergil's *Æneid*, book iv, in Spenserian stanzas; *Selected Parts of Horace* (1652); *The Lusiad* (1665), in *ottava rima*, from the Portuguese of Camoëns; *La Fida Pastora* (1658), Latin verse from Fletcher's *Faithful Shepherdess;* and *Querer por solo querer* ('To Love only for Love's Sake,' 1670), and *Fiestas de Aranjuez* (1671), comedies from the Spanish of Antonio de Mendoza. He wrote some original English poems of considerable merit, which have never been published together. His *Letters* were collected and published in 1724. Consult the *Memoirs of Lady Fanshawe* (London, 1907, ed. by H. C. Fanshawe), *née* Anne Harrison, whom he married in 1644 and who lived until 1680.

FAN SHELL. A scallop (*Pecten*); so called from its shape and radiating ridges.

FAN'TAIL. 1. A breed of domestic doves. See Pigeon, and Plate of Pigeons. 2. One of the small flycatchers of India and Australasia, of the genus *Rhipidura*. These have long tails of loose feathers, which they "fan out" prettily by a sidewise flirting movement as they dodge about in pursuit of insects. They are familiars of every rural garden, sing much at night, and build exquisite nests. Some 50 species are known, scattered from New Zealand to the Himalayas. 3. A warbler (*Cisticola schœnicola*) of the Mediterranean basin, remarkable for the beautiful nest it builds in the form of a basket attached to upright stalks of grass, and filled with a cup of cottony material, and for the great variety in the coloring of its eggs.

The term "fan-tailed" has been used by systemists as a name for all birds except *Archæopteryx*, i.e., the Euornithes (q.v.), because the concentration of the caudal vertebræ into a pygostyle gives the tail feathers a typically fanlike shape; hence Dr. Theodore Gill's term Eurhipiduræ, as an equivalent of Euornithes.

FAN′TAN (Chinese *fan*, number of times + *tan*, apportion). A gambling game, very popular in China. In the American game a pack of 52 cards is used. The deal starts by cutting the cards. Ace high deals. The cards are then dealt to the left, one at a time. As many as eight persons may play. The cards remaining at the finish of the deal are dealt face down to the centre of the table. The first player at the left of the dealer must have an ace to play, in which event he plays the ace to the centre of the table. Having no ace, he must ante the amount agreed upon (usually 5 cents or less) to the centre of the table and draw one of the remaining cards. Thus the game proceeds until an ace can be played, after which the different stacks of cards are built up consecutively to the king. The first player ridding himself of his cards wins the pot. Failure to play a card in turn is punished by a fine equal to the amount of the ante for every card remaining in all of the players' hands.

In China cards are not used, the game being played on a table on which is marked a square whose sides are numbered from one to four, or by means of a square piece of metal similarly inscribed. An unknown quantity of small coins are placed within this square and covered with a bowl. The players play their stakes against any side of the square, whereupon the banker uncovers the coins and removes them, four at a time. The player wins who has backed the number corresponding to the number of coins, from four down, which are left when the remainder have been removed, and receives five times the amount of his stake, less the banker's commission.

FANTASIA, *It. pron.* fȧn'tȧ-zē′ȧ (It., fancy). 1. In music, a composition somewhat free in form, as opposed to the strict form of the fugue or sonata. 2. An improvisation (q.v.). 3. The fantasia, also free fantasia, that part of a movement in sonata form which follows the first, or exposition, section. It is also called "development section," because the themes used in the first section are here more fully developed. (See SONATA.) 4. In the seventeenth and eighteenth centuries the term "fantasia" was applied to a composition in which a theme was developed in free imitation (q.v.).

FANTI, or **FANTEE**, fȧn-tē′ *or* făn′tē. Formerly a separate African state, of about 20,000 square miles, now a part of the British Gold Coast Colony, situated on the coast south of Ashanti. The Fantis, who are closely allied to the Ashantis, waged incessant wars against the latter until subjugated in the beginning of the nineteenth century. See ASHANTI.

FANTI, făn′tē, MANFREDO (1808–65). An Italian general. He was born at Carpi, near Modena. In 1831 he was condemned to death for his part in the rising against the Duke of Modena, but he escaped to France; in 1833 he was with Mazzini in the attempted invasion of Savoy. During 1835–48 he fought in Spain and distinguished himself in the Carlist War and was promoted to the rank of colonel on the general staff at Madrid. In Italy in 1849 he fought against the Austrians. During the Crimean War he served as general of a division, and in the War of 1859 commanded the forces of the provisional governments of Tuscany, Modena, the Romagna, and Parma. In 1860–61, as Minister of War and Marine, he increased the army and brilliantly conducted the campaign against the papal troops in Umbria. As chief of general staff to Victor Emmanuel, he reduced Gaeta and Mola. In 1872 a bronze statue was erected to his memory in Florence. Consult the biography (Florence, 1906) by Di Giorgio.

FANTINE, fäɴ′tēn′. The mother of Cosette, in Victor Hugo's *Les Misérables*. She gives her name to part i of the novel.

FANTIN-LATOUR, fäɴ′täɴ′ lȧtōōr′, HENRI (IGNACE HENRI JEAN THÉODORE) (1836–1904). A French portrait painter and lithographer. He was born at Grenoble Jan. 14, 1836, the son of Theodore Fantin-Latour (1805–75). He studied first with his father, then in Paris under Lecoq de Boisbaudran, and later for a short time with Courbet. Although he frequently exhibited at the Salon, he is usually identified with the artists opposed to academic tradition, and was represented at the famous Salon des Refusés in 1863 with Manet, Whistler, and others. Fantin-Latour is best known for his portraits and portrait groups, simply but directly treated and of sober but delicate and luminous color. Among his best portraits are those of Manet at the Art Institute, Chicago; "A Lady," in the Metropolitan Museum, New York; Edwin Edwards and his wife, in the National Gallery, London; and Madame Fantin-Latour, Luxembourg Museum. His groups have a rare, almost puritanic charm, and are pervaded by a tender, intimate note. The most celebrated are "An Atélier in the Batignolles," including portraits of Zola, Monet, Manet, and other painters (Luxembourg); "Around the Piano," with portraits of celebrated musicians; and "Homage to Delacroix" with Whistler, Champfleury, and others (Louvre). He excelled in pastel and during his later years in lithography. Some of his lithographs were delicate portraits; others imaginary and fantastically romantic compositions illustrative of the operas of Wagner, whom he ardently admired, or interpretations of Beethoven, Berlioz, Schumann, and other musicians. A complete collection of his lithographs is in the Louvre; others are in the British Museum and the Dresden Gallery. Fantin-Latour also painted flowers with exquisite art, his best pieces being in England, where he lived for some time. He received many medals and was an officer of the Legion of Honor. He died Aug. 28, 1904. For his biography, consult Jullien (Paris, 1909); for a catalogue of his lithographs, Hédiard, *Les maitres de la lithographie* (ib., 1898–99); for reproductions, *L'Œuvre lithographique de Fantin-Latour* (ib., 1907).

FANUM FORTUNÆ. See FANO.

FAN VAULTING. A kind of late Gothic vaulting peculiar to the Perpendicular (q.v.) style in England, called also "fan-tracery vaulting." It was the final, logically developed decorative outcome of the English practice of multiplying the structural ribs of a Gothic vault. In order to avoid the twisted surfaces incident to the French vault system, which employed only three pairs of ribs (see VAULTING), the English early introduced intermediate *tierceron* ribs, as at Lincoln and much later at Exeter, by which the four triangular vaulting compartments of a bay were divided into a number of much narrower triangular surfaces, which could be independently laid up. When these ribs were given approximately the same curvature, the vaulting masses on each side in each bay became approximately semicircular in horizontal section, while the multiplying of the ribs greatly enhanced the decorative effect of the vaulting. The addition of subordinate bridging ribs (*liernes*, q.v.) was purely for decorative effect, producing star patterns, net patterns, etc. (Canterbury, Winchester, Tewkesbury, Gloucester, etc., 1368–1400). This led to the design and construction of vaults in which the ribs were treated more and more as mere decoration, and the concave-conoid form of the vault masses was emphasized. From about 1450 on, these masses were built up in semicircular horizontal courses, till they touched at the ridges, and the visible surfaces were adorned with paneling in relief—the decorative reminiscence of the structural ribs—forming fanlike patterns of great elegance. Long stone pendants were introduced, from which subordinate conoids were sprung, each with its fanlike paneling. The steps of this development may be traced from the chapter-house vaults (Westminster, Salisbury, Wells, etc., 1260–82) through such examples as the vaults of the retrochoir of Peterborough, the Divinity School at Oxford, the chapels of St. George at Windsor and of King's College at Cambridge, to the superb, florid, and final example in Henry VII's Chapel at Westminster (1509). See VAULTING; and consult Willis, "Construction of the Vaults of the Middle Ages," in *Transactions of the Royal Institute of British Architects* (London, 1842), and Bond, *English Church Architecture* (ib., 1913).

FA PRESTO. See GIORDANO, L.

FARABI, fȧ-rä'bē. See AL-FARABI.

FARABI, fa-rä'bē, ABU NASR MOHAMMED IBN TARKHAN IBN UZLAJ AL (c.870–950 A.D.). One of the earliest of Moslem philosophers, called "The Second Master," the first being Aristotle. He was born of Turkish stock at Farab in Turkestan, but proceeded to Bagdad, where he devoted himself to the study of medicine, mathematics, and philosophy. From Bagdad he went to Aleppo, where, except for his close relations to Saif al Daula (q.v.), the ruler of this city, he lived a life of scholastic retirement. He died in Damascus, while on a visit to that place in company with Saif al Daula. Although a prolific writer, who occupied himself with philosophy, medicine, natural science, mathematics, and music, Farabi never worked out a system of philosophy. He was largely influenced by Aristotle, but also acquainted with Platonic and Neoplatonic thought. He was distinguished by the lucidity of his reasoning and the excellence of his style, but such was the fame acquired by his successor Avicenna (q.v.) that Farabi was for a long time almost entirely eclipsed, and his importance has been fully realized only in recent times. Dieterici, who made a profound study of his philosophy and translated many of his works into German, called special attention to his socio-political views. His *Madina al fadila*, or 'Model State,' has been designated as a Utopia (q.v.) because it describes ideal relations; yet it is not a romance of the future, but a sober discussion of the proper forms of social life. Among his writings was also an encyclopædia of the sciences. Consult: *Alpharabii vetustissimi Aristotelis interpretis opera omnia* (Paris, 1638); Schmolder, Arabic text and Latin translation of two dissertations, in *Documenta Philosophiæ Arabum* (Bonn, 1836); Steinschneider. *Alfarabi's des arabischen Philosophen Leben und Schriften* (St. Petersburg, 1869); Dieterici, *Alfarabis philosophische Abhandlungen* (Leyden, 1890); id., Ger. trans. of this work (ib., 1892); id., *Alfarabis Abhandlung der Musterstaat* (ib., 1895); id., *Der Musterstaat von Alfarabi aus dem Arabischen übertragen* (ib., 1900); Brockelmann, *Geschichte der arabischen Litteratur*, i, 210 ff. (Weimar, 1898); Nicholson, *A Literary History of the Arabs* (Cambridge, 1907).

FAR'AD. The farad is the so-called "practical" unit of electric capacity, being by definition the capacity of a condenser whose potential is one volt when charged by one coulomb. It is substantially equal to the C. G. S. electromagnetic unit of capacity, divided by 10^9, or to the C. G. S. electrostatic unit of capacity, multiplied by 9×10^{11}. One-millionth of a farad is called a "microfarad." The name "farad" was given the unit of capacity in honor of Michael Faraday, who made such important discoveries in regard to the nature of the capacity of condensers. See ELECTRICAL UNITS.

FAR'ADAY, MICHAEL (1791–1867). A distinguished English chemist and physicist. He was born near London, the son of a blacksmith, and at an early age was apprenticed to a bookbinder. He devoted his leisure time to science and, among other things, made experiments with an electrical machine of his own construction. In 1812 he was able to attend four chemical lectures of Sir H. Davy (q.v.), then at the zenith of his fame, and he ventured to send to Davy the notes he had taken, with a modest expression of his desire to be employed in some intellectual pursuit. Davy engaged him as his assistant at the Royal Institution, and later took him to the Continent as assistant and amanuensis. On their return to London Davy confided to him the performance of a number of important experiments, which led in his hands to the liquefaction of certain gases by pressure. Here he showed that extraordinary power and ingenuity which resulted in so many important discoveries and rendered his name familiar to every student of physics. In 1824 he was elected to the Royal Society and in the following year was appointed director of the laboratory of the Royal Institution, where later he was promoted to Davy's post of professor of chemistry. Faraday's first important discovery was the revolution of a magnetic needle around an electric current (1821), and 10 years later came his work on magneto-electricity and induction. Following this came the discovery of the action of one current on another, when the deflection was observed as before, and also when a magnet was inserted or withdrawn in a coil of wire. These discoveries naturally furnished the foundation for the development of magneto and dynamo machines and other inventions of importance. Faraday's researches in electrolysis are also of great value, and to him is due the discovery that the amount of liquid decomposed is proportioned to the current passing through

MICHAEL FARADAY
FROM A PAINTING BY JOHN PHILLIP

the solution, and that equal quantities of electricity decompose equivalent amounts of different electrolytes. To him we owe the terms "anode" and "cathode." He was also the discoverer of "specific inductive capacity," or the measure of the electric attraction and repulsion exerted through various dielectrics or insulating substances. According to Faraday, both electrostatic and electromagnetic induction takes place along curved lines, which he dominated "lines of force." Faraday discovered that the plane of vibration of a beam of polarized light is rotated under the influence of a powerful magnetic field. The phenomena of diamagnetism, or the repulsion of certain substances, were also carefully investigated by Faraday, and many valuable results obtained. In chemistry, also, where most of Faraday's early work was done, many important discoveries are to be recorded, including a number of new chemical compounds. Of these perhaps the most important is an investigation on new compounds of carbon and hydrogen (*Philosophical Transactions*, 1825), inasmuch as it included the discovery of benzol, which is the basis of aniline dyes. He also carried on a number of experiments looking to the production of optical glass with unusual power of refraction; but while glass with an index of refraction of 1.866 was made, it did not prove available, on account of its softness.

Faraday was one of the most brilliant experimentalists that science has ever known, and to him credit must be given for much that electricity has accomplished. The experimental work that he had done with such care furnished a basis for the mathematical and theoretical discussions of Maxwell, and his *Experimental Researches in Electricity* (1839–55) contains a complete record of his investigations. In 1835 Faraday received a pension of £300 a year for the rest of his life, and in 1836 he became the scientific adviser of Trinity House. By royal grant he occupied a house at Hampton Court. He was invited to become the president of the Royal Society, but declined the honor.

Faraday was a deeply religious man, belonging to a small sect of Christians known as Sandemanians, and was generous and sympathetic to a high degree. His last years were marked by failing powers of mind and body, yet in spite of this some of his best work was accomplished shortly before his death. In addition to the *Experimental Researches in Electricity* (1839–55), he published *Researches in Chemistry and Physics* (1859), and many papers in the *Proceedings of the Royal Institution* and the *Philosophical Magazine*. For his life and work, consult: Jones, *Life and Letters of Faraday* (London, 1870); Tyndall, *Faraday as a Discoverer* (2d ed., ib., 1870); Thompson, *Michael Faraday: His Life and Work* (ib., 1888).

FARADAY EFFECT. See Electricity; Light.

FARADAY TUBES. See Electricity.

FAR'ADISM. See Electricity, Medical Uses of.

FARALLON (făr'ȧ-lŏn) **ISLANDS**, or The Farallones. A group of seven small, rocky islands and several islets off the coast of California, about 30 miles directly west of San Francisco and a part of that city (Map: California, B 5). Their extreme points—northwest and southeast—are about seven miles apart. On the southernmost island stands an important lighthouse, in 37° 41′ 58″ N., 123° 04″ W., having a flashing light of the first order, 358 feet above the sea and visible 26 miles, and also a steam siren. The Farallones are the resort of myriads of sea gulls and murres, and in 1909 the islands were created a Federal bird reservation, thereby assuring the full protection of these birds for all time. Great numbers of sea lions and rabbits are also found. The rainfall is heavy, amounting yearly to 18 or 19 inches.

FARANDOLE. A national Provençal dance of moderate movement in $\frac{6}{8}$ time. It has been used by Gounod in his *Mireille* and by Bizet in his suite *L'Arlésienne*.

FARCE (Fr. *farce*, from Lat. *farsus*, p.p. of *farcire*, to stuff). A dramatic piece intended to excite laughter by exaggeration and extravagance rather than by the truthful delineation of life. It differs from comedy mainly in the emphasis placed on plot. In farce the characters are what they are because the working of the plot requires them to be this and not something else, while in comedy the plot is subordinated to the characters. Broadly speaking, farcical elements have entered into many of the forms of primitive comedy. Thus, both in the significance of the word and the kind of "stuffing" it denotes, farce would seem to bear an analogy to the early Latin *saturæ*, while the popular *commedia dell' arte* of a much later day in Italy were of a somewhat similar character. The name *farce*, however, seems to have been first applied in its present sense particularly to the pieces produced by the French society of the *clercs de bazoche* as a contrast to the *moralities* played by the religious orders. They have been confounded in their origin with the *sermons joyeux*, or parodies on the ritual of the church. A characteristic of many of the farces was a mixture of dialects. In one scene of the *Farce de Pathelin*, the principal personage speaks seven or eight. This most famous of all the farces has been attributed to different authors, most commonly to Pierre Blanchet, one of the *Bazoche* in the fifteenth century, and even to the poet Villon. At a later date Molière elevated and refined mediæval farce into pure comedy in his *Médecin malgré lui*, *Les précieuses ridicules*, and other inimitable productions. In England the farce came, about the beginning of the eighteenth century, to be regarded as something distinct from comedy proper and to constitute a special form of composition. Out of the numerous farces which have been performed before English-speaking audiences, those of Samuel Foote especially have kept a place in literature. On the stage at the present day the name "farce," or sometimes the vulgarism "farce comedy," is freely applied to almost any light piece in which the comic goes to preposterous lengths. Consult: Petit de Julleville, *La comédie et les mœurs en France au moyen âge* (Paris, 1886), and *Répertoire du théâtre comique en France au moyen âge* (ib., 1886); Inchbald, *A Collection of Farces and Other Afterpieces* (London, 1815).

FARCY. See Glanders.

FAR'DEL-BOUND (OF. *fardel*, burden, Sp., Portug. *fardel*, diminutive of *fardo*, *pack*, from Ar. *fardat*, bundle of merchandise + *bound*). A form of indigestion in cattle, sheep, and goats, characterized by impaction of the fardel bag, or third stomach, with food, which is taken in between the leaves of this globular stomach, there to be fully softened and reduced. While it may seem to be a primary disease, in very many cases it occurs as a result of some acute febrile or inflammatory affection. When the food is unusually tough, dry, or indigestible, consisting, e.g., of over-ripe clover, vetch, or rye grass, the stomach cannot moisten and reduce it with sufficient rapidity; fresh quantities continue to be taken in, until the overgorged organ becomes paralyzed, its secretions dried up, and its leaves affected with chronic inflammation. The slighter cases, so common among stall-fed cattle, are "loss of cud," indigestion, and torpidity of the bowels. In severer form there are also fever, grunting, bloating of the first stomach, and sometimes stupor or epilepsy. The overgorged stomach can, moreover, be felt by pressing the closed fist upward and backward underneath the false ribs on the right side. The symptoms often extend over 10 days or a fortnight. Purgatives and stimulants are to be given. Consult J. Law, *Text-Book of Veterinary Medicine*, vol. ii (Ithaca, 1905–11).

FAR EASTERN QUESTION. The term originally applied to problems arising out of the participation of non-Asiatic nations in Asiatic awakenment and development; more specifically it covers the claims, rights, and interests of certain Western powers, and (since 1894) of Japan, to what are styled "spheres of influence" in China; as, e.g., British interests along the Yang-tse valley and in Tibet; Russia's interests in Mongolia and Manchuria; Japan's sovereignty over Korea and her ceded privileges in Manchuria; French interests in Indo-China; Germany's lease of Kiaochow and her growing commercial and industrial investments in Shantung; and Portugal's possession of Macao.

In opposition to these rival territorial claims and claimants is the policy maintained by successive United States governments since it was first enunciated by Anson Burlingame in 1868, defending the rights of China to "eminent domain over her own territory," and protection against partition by land-hungry nations. This policy was more clearly defined by the late John Hay during the diplomatic discussions which arose over the Boxer troubles in 1900, in what has since been known as the "Open Door" declarations. Certain stipulations, reluctantly accorded by some of the rival powers, guaranteed, as a result of the good offices of the United States, the "administrative entity" of China.

While succeeding events led to certain deviations from this policy, materially it remains unaltered; and it was more recently amplified by what have been called the "Hands Off" pronouncements made by President Wilson and Secretary of State Bryan (1912–14). The policy conceived by the United States, through Burlingame, was to conserve China's integrity, pending her development along western lines; Hay's "Open Door" policy was to guarantee this integrity while fostering China's development through closer commercial communion and the extension of ports opened under foreign treaties with China; and the "Hands Off" policy aims to prevent the improper or impolitic exploitation of China in the interest of international financial combinations as opposed to China's own national interests.

These complex problems have been further complicated through the great changes which have occurred within the last two decades in the Orient, and signs are not wanting that still further complications are certain to arise. The rapid and continuous growth of the German Empire and consequent changes in the balance of power in Europe; the advent of Japan as a first-class power; the spread of the Nationalist movement in India and in Egypt; the occupation of the Philippines by the United States (1898) as a result of the war with Spain; the decadence of Lamaist influence in Tibet—these, among many other causes, have operated to intensify the difficulties presented in various aspects of the Far Eastern Question.

But, overshadowing all these outside interests and influences, are the awakening of China itself and the amazing spread of the national and Republican spirit throughout what was, until 1911, the most conservative empire in the world. It is this process of nationalization in China, with its manifestations of immediate weaknesses and potential strength, which now seems to dominate the Far Eastern Question at all points; touching, on the one hand, upon some of the most delicate matters of purely European diplomacy, and, on the other, interlocking itself with the larger problems of Pacific development and Pacific control.

The Far Eastern Question, as such, may be said to have had its inception in the early contests between the Portuguese, Spanish, Dutch, and British traders for preëminence and predominance in the Oriental seas. And, just as it has reached its most acute stage with the fall of the Ta-Ching (or T'sing), commonly called the Manchu, dynasty, it received its first impetus during the conflict between Ming and Manchu which ended (in 1644) with the overthrow of the Ming dynasty. It was then (1610–44) that the Portuguese seized possession of Macao (occupied as a trading post, 1537; annexed, 1849), while the Dutch endeavored to dislodge Koxinga and his force of Ming adherents from the island of Formosa. It is also an important historical fact that it was the loss of Formosa to the Japanese (1895) which fanned into flame the spirit of Chinese nationality and contributed considerably towards extending the agitation which culminated in the establishment of the Chinese Republic (Feb. 12, 1912). Formosa and the island of Hongkong represented, and still represent, to the Chinese what the isles of Greece have always meant to the Macedonian and the Thessalonian. Restrained by the continually weakening hands of the Manchu bureaucracy, the Chinese, particularly in the southern and eastern provinces, chafed under the persisting pressure from without, which had increased rather than diminished with every concession granted rival foreign nations.

The creation by the British of a new Gibraltar at Hongkong (1842), with the later acquisition of the territory on China's mainland from Kowloon to Mirs Bay and Deep Bay (1860–98); the advance of the French from the southern peninsula of Annam, threatening the rich provinces of Yunnan and of Kweichow and Kwangsi; and encroachments by Russia on China's western and northern borders, exasperated China and unquestionably had much to do with bringing about the war with Japan (1894–95), apart altogether from the direct cause of that rupture (conflicting interests in Korea). The war between Japan and China, while it revealed Japan's strength and China's weakness to an extent which astounded the outside world; and while, by the terms of the Treaty of Shimonoseki (1895), it cost China an indemnity of Hk. Taels

230,000,000 in addition to loss of territory as well as of prestige, warned her that her very existence as a nation was at stake. Thus arose China's willingness, amounting almost to desperation, to assume western ways and institutions and to turn to western powers for advice and for protection. While improving her relations with the United States, China naturally looked first for immediate assistance to her most powerful western neighbor, Russia. And Russia eagerly availed herself of the opportunity to profit under the cloak of friendship.

Balked by the Treaty of Berlin (1878) from forcing her way to a direct outlet on the Mediterranean and control of the Dardanelles, the foreign policy of Russia became absorbed in the task of finding an ice-free outlet somewhere on the Pacific. Colonization in Mongolia and North and South Manchuria was fostered under various pretexts; and plans were perfected to carry the Siberian Railway across Chinese territory from Stretensk to Vladivostok. Russia seized upon the Peace of Shimonoseki and China's eagerness for friendly mediation as the means of putting these plans into immediate effect. The original terms of the treaty (April 14, 1895) bound China (1) to agree to the complete independence of Korea; (2) to cede the Liaotung peninsula and its littoral; (3) also Formosa and the Pescadores; (4) to pay indemnity of Hk. Taels 200,000,000; (5) to open up Shashih, Chungking, Suchow, and Hangchow to commerce, and of the Yang-tse to navigation. Russia, with the assistance of Germany and France, England abstaining, secured the revocation of the second clause (relating to the Liaotung peninsula, etc.), compelling Japan to accept instead an additional Hk. Tls. 30,000,000 indemnity. The selfish motives behind the Russo-French-German compact were soon apparent. Russia proceeded immediately to carry out her railway plans and (1898) obtained possession of the southern part of the Liaotung peninsula with its two valuable harbors, Port Arthur and Talienwan (Dalny). Germany, under the pretext of compensation for the murder of two missionaries, secured the port of Kiaochow, and important concessions in Shantung Province (1898), while France improved her frontier lines in the Mekong valley, secured railway and mining concessions in Yunnan and Kiangsi, and (1898–99) a 99 years' lease of the Bay of Pangchangwan, opposite the island of Hainan. Great Britain, in protection of her own interests and those of China, was given a lease of Wei-hai-wei as long as Russia held Port Arthur.

England was first among the European nations to recognize the growing power of Japan, and in the agreement (Jan. 30, 1902) which later became the Anglo-Japanese Alliance (renewed and extended, 1911) she directed her policy in the Far East to solidify her own interests and to support those of Japan. Japan, fretting under the curtailment of her conquests by Russia, and Russia's subsequent occupation of the Liaotung, set herself to checkmate Russia on the Far Eastern mainland. An excuse was presented through Russian exploitation in Korea (1903). Diplomatic controversies culminated in the Russo-Japanese War (1904–05), which ended in the discomfiture of Russia and her expulsion from the shores of the Yellow Sea.

Under the Treaty of Portsmouth (Sept. 5, 1905) Japan was given a free hand in Korea and received from Russia the leases of Port Arthur and Dalny, together with their littoral; the South Manchurian Railway from Chingkiang to Port Arthur, and the mining and other rights pertaining to it; the southern half of Saghalien from the 50th latitude; the right of navigation in the bays of La Perouse and Tartary; and the rights of fishing in Russian territorial waters. At the same time (Aug. 12, 1905) there was promulgated an agreement between Great Britain and Japan which expressly guaranteed the maintenance of the *status quo* in the Far East. Korea was declared formally under the protection of Japan (Nov. 17, 1905) and was annexed (Aug. 22, 1910). During the latter part of 1909 Secretary of State Knox presented on behalf of the United States a proposal to neutralize the South Manchurian Railway. This proposal was rejected by Japan (Jan. 21, 1910), and the outbreak of the Chinese revolution (October, 1911) found practically all the European nations and Japan scrambling for new railway and other concessions.

The loss of the Liaotung peninsula and of the South Manchurian Railway to Japan deprived Russia of the use of the Chinese Eastern Railway for strategic purposes, and henceforth her aim has been to seek another outlet. Hardly had the ink dried upon the Portsmouth Treaty than the Russian government authorized the double-tracking of the Siberian Railway and granted the appropriation for the construction of the Amur lines. These works have been actively pushed ahead in the last four years, and the Amur line is nearing completion, while the double-tracking of the Siberian Railway is about 75 per cent completed. Many other lines are projected for the exploitation of central Asia, some of which have received the sanction of the Russian government. Vladivostock has been made practically impregnable, but, as it lies exposed to Japan, it may be captured in another war. As a commercial port, however, it has great disadvantages; for it is open for only half the year and can never serve as an adequate outlet for the great Siberian country and its rapidly extending trade and industries. Fronted by Japan in South Manchuria, Russia cannot hope to secure a seaport in that direction except through another costly and possibly more disastrous war. In most books dealing with Russian policy in Asia, the fact is emphasized that one of her great dreams is an approach to Peking across Mongolia via Kalgan. Recent Russian diplomacy is believed to suggest that she seeks an understanding with England to secure this direct right of way to the Yang-tse. Japan, however, appears to be cognizant of and antagonistic to these intentions, and it is now (June, 1914) proposed by Count Okuma, on the part of Japan, to ally Japanese and British interests in the Yang-tse. Formal recognition of the British "Sphere of Influence" in the Yang-tse valley, including Honan and Chekiang, as well as the provinces bordering on the river, dates from the Anglo-Russian Agreement (April 28, 1899) in which the Russian government specifically covenanted not to seek any concession within that sphere, England pledging herself not to seek concessions in Russia's sphere north of the Great Wall, the Shanhaikwan-Neuhwang Railway extension, previously provided for, being excepted from this provision.

Coincident with the outbreak of the Chinese revolution, disaffection occurred among the Mongolians of Outer Mongolia, and in the early part of 1912 the Mongols, replying to Yuan Shih-kai's proclamation of March 26, refused to participate in the establishment of Republican government. Russia then concluded that the time had come when she could not only secure from the rebellious Mongols commercial privileges which she had been seeking from China, but that also, while maintaining her friendly position towards that country, she could raise up in Outer Mongolia a barrier against the immigration of Chinese within her own borders, which she had been endeavoring to resist. A convention with the Khalkas embodying these essential principles of Russian policy was determined upon, and in the latter part of 1911 a Russian diplomatic agent to Outer Mongolia arrived at Urga to put through these negotiations.

Difficulties arose between the Russian agent and the Mongolians themselves, and resentment of Russia's intrigue became very general in China. The Urga Convention (Nov. 3, 1912) declared that, in consideration of Russia's "lending her assistance to Mongolia in preserving the autonomous régime it has established, as well as the right to have her national army and to admit neither the presence of Chinese troops on her territory nor the colonization of her land by Chinese," the Mongols concede to the Russians the most complete freedom of trade (but no rights of monopoly) "in every kind of product of the soil and industry of Russia, Mongolia, and China." The convention further gave Russia the right to control any treaty arrangements the Mongolians may wish to enter into later "with the Chinese or another foreign power," and which might infringe or modify this convention. As soon as these terms were published, the Republican Parliament in Peking clamored for war with Mongolia and with Russia, if necessary. President Yuan Shih-kai dispatched a military force to deal with the Mongols and remonstrated with Russia. After protracted discussion a declaration was signed Nov. 3, 1913, on the part of Russia and China by which Russia recognized Chinese suzerainty over Outer Mongolia, while China recognized its autonomy. Russia pledged herself to send no troops to Mongolia beyond the consular guards, nor to intervene in the administration of the country, nor to attempt colonization. Diplomatic conversations were (June, 1914) proceeding with a view of establishing coöperation between Russia and China for the administration of Outer Mongolia. At the same time disagreement had occurred between the Mongols as to who should be their ruler, some favoring the *Hutuktu*, or, as he is also called, the *Boddo Khan* (holy prince), a lama, who is married and has two sons; and others the *Sainnoyin Khan*, president of the Council of Ministers. The ultimate choice may have an important bearing not merely upon future events in Mongolia, but also upon a correlated controversy, the question of Tibet. The Dalai Lama of Lhassa is recognized in Mongolia, but there, as in Tibet itself, Lamaism is believed to be disintegrating.

Russia's policy in regard to Mongolia and Manchuria led naturally to an aggressive English policy on the northern frontier of India. And this latter policy was assisted by the results of the Younghusband expedition and the difficulties which arose between the Dalai Lama and the Manchu Empire just prior to the Chinese revolution. Strategically the occupation of the lofty plateaus of Tibet is of vast importance in the possible defense of England's Indian empire against invasion from the north. China has always claimed sovereignty over Tibet, and her suzerainty has been generally conceded. A conference was (June, 1914) proceeding, as a result of which it was hoped to amicably adjust British and Chinese interests in this ancient and conservative land of Lamaism.

The Far Eastern Question, it will thus be seen, had now entered upon an entirely new phase. First, an issue between certain purely European powers as to rival rights and expectations in the Orient, it then became a contest between European combinations and Japan as to which nation should profit most in the partition of the Chinese Empire. Japan—progressive, aggressive—required room for her rapidly growing population to expand freely and develop new importance. But China awakened before partition was more than begun. And China, with her millions of men, her concentrated energy, and her vast resources, bids fair to pronounce possibly a decisive note in the ultimate solution of the Far Eastern Question, which manifestly now presents itself in the most acute form it has yet assumed.

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FAREL, fȧ'rĕl', GUILLAUME (1489–1565). A friend of Calvin and active promoter of the Reformation in Switzerland. He was born of noble family at Fareaux, near Gap, Dauphiné, in 1489. He studied in Paris, became professor in the Collège Le Moine, and was distinguished for his zeal for the Catholic church. Intercourse with the Waldenses and the influence of Lefèvre d'Estaples (see FABER) led him to accept the new teachings, and his vehement nature at once led him to attempt to make proselytes. In 1521 Bishop Briçonnet provided for him at Meaux, but persecutions followed him there. He went to Basel and was kindly received by Œcolampadius, and there, on Feb. 15, 1524, he publicly sustained 13 theses on points in dispute between the Reformers and the church. He preached in the Canton of Bern, and through his exertions the towns of Aigle, Bex, Olon, Morat, and Neuchâtel embraced the Reformation. From 1532 till 1538 he labored mainly at Geneva, but was compelled temporarily to leave the city several times. In 1535 the town council of Geneva formally proclaimed the Reformation, but the organization fell into Calvin's hands rather than Farel's. Both Reformers had to leave the city in 1538, and Farel went to Neuchâtel and did good service in setting the affairs of the church there in order. He was present at Geneva at the burning of Servetus in 1553. In 1557 he was sent with Beza to the Protestant princes of Germany to implore aid for the Waldenses and on his return sought a new sphere of labor in his native province. In November, 1561, he was thrown into prison, but was soon liberated. He died at Neuchâtel, Sept. 13, 1565. Farel's writings are not very important. Some of them may be found in *Du vrai usage de la croix* (Geneva, 1540; new ed., 1865). His letters are in Herminjard, *Correspondance des réformateurs dans les pays de la langue française* (9 vols., Geneva, 1866), and in the *Corpus Reformatorum* (Brunswick, 1834–1900). Consult: Kirchhofer, *Das Leben Wilhelm Farel's* (Zurich, 1831–33); Schmidt, *Etudes sur Farel* (Strassburg, 1836); id., *Wilhelm Farel und Peter Viret* (Elberfeld, 1860); Bevan, *William Farel* (4th ed., London, 1893).

FARENHOLT, fär′en-hōlt, OSCAR WALTER (1845–). An American naval officer, born near San Antonio, Tex. He entered the navy as a seaman in 1861, was wounded at Pocotaligo, S. C., participated in attacks on Charleston, S. C., and on Fort Sumter, and aided in the capture of Fort Fisher, N. C., and the recapture of Plymouth. He became acting ensign in 1864 and ensign in 1868, and thereafter was promoted through the various grades, becoming captain in 1900 and rear admiral in 1901. During the Spanish-American War he had charge of Dewey's base of supplies and information at Shanghai, China. He was commandant of the navy yard at Cavite, P. I., in 1900 and after commanding the *Monadnock* of the Asiatic Station in 1901 was retired. Farenholt is the only officer who ever rose from seaman to the rank of rear admiral in the United States navy.

FARENSBACH, fä′rens-bäG, JÜRGEN VON (1551–1602). A Livonian general. Sent as the Ambassador of Livonia to Czar Ivan the Terrible, for the purpose of concluding a treaty of peace, he entered the Russian service and greatly distinguished himself by winning the decisive battle of the Oka against the Tatars (Aug. 1, 1572). Afterward he served in the Danish and Polish armies and in 1586 was invested with the rank of a senator of the Polish crown by Sigismund III, whom he had assisted in gaining the throne of Poland. As field marshal of Poland, he subsequently fought against Sweden, where, however, he was defeated. He was killed in the attack on the castle of Fellin, May 17, 1602.

FAREWELL, CAPE. See CAPE FAREWELL.

FAR′FA, ABBEY OF. A Benedictine monastery, at one time among the richest and most famous of Italy, situated about 26 miles from Rome. It is said to have been founded in the middle of the sixth century by St. Laurence, Bishop of Spoleto, and soon reached a position of importance, receiving endowments from the Lombard and Carolingian rulers and from the popes. The monks were driven out by the Saracen invaders about 890, and it lay desolate for 50 years. When Alberic set Odo of Cluny over all the monasteries in the neighborhood of Rome, attempts were made at reforming the ill-regulated lives of the monks, but at first without success. The zealous Abbot Hugo, however, brought in a new set of monks at the end of the tenth century, and Odilo of Cluny, visiting Italy, inspired him to introduce the Cluniac reform. Pope Nicholas II consecrated the conventual church in 1060, and learning began to flourish in a marked degree. The librarian of the monastery, Gregory of Catina, rendered a great service to Italian history by compiling between 1105 and 1119 the *Chronicon Farfense*. The riches of the abbey increased greatly, and it owned no less than 683 churches and convents, 2 towns, 132 castles, and over 30 villages and hamlets. From the end of the fourteenth century it was held *in commendam* by cardinals, and Gregory XVI annexed it in 1842 to the cardinal-bishopric of Sabina. *Il Chronicon Farfense* was published by Balzani (Rome, 1903); *Consuetudines Farfenses*, dating 1010, by Albers (Stuttgart, 1900).

FARGO, fär′gō. The largest city in North Dakota and the county seat of Cass County, 240 miles by rail northwest of Minneapolis, Minn., on the Red River of the North, and on the Northern Pacific, the Great Northern, and the Chicago, Milwaukee, and St. Paul railroads (Map: North Dakota, H 4). Fargo is an important grain market and one of the largest distribution centres for heavy farm machinery in the country. It has also extensive jobbing interests in groceries, fruits, and notions. Among its industrial establishments are knitting mills, creameries, a foundry, bottling works, and manufactories of harness, candy, corsets, mattresses, bed springs, artificial limbs, trunks, crackers, etc. Fargo is an educational centre, containing the North Dakota Agricultural College (founded in 1890), Fargo College (Congregational, opened in 1887), Sacred Heart Academy (Catholic), Oak Grove Seminary (Lutheran), the Western School of Expression, two music conservatories, and three public libraries. Other features are a United States land office, several hospitals, and a number of fine parks and drives. The city adopted the commission form of government in 1913. It owns and operates its water works and filtration plant. Settled in 1871, Fargo was incorporated in 1875. A fire on June 7, 1893, destroyed property valued at $3,000,000. Pop., 1900, 9589; 1910, 14,331; 1914 (U. S. est.), 16,351; 1920, 21,961.

FARGO, WILLIAM GEORGE (1818–81). A pioneer American expressman, born at Pompey, N. Y. After working as a grocery clerk, freight agent, express messenger, and resident agent at Buffalo, he organized with Henry Wells, in 1844, Wells and Company (later, Livingston and Fargo), a carrying company in business between Buffalo and western points. This firm was consolidated with others in 1850 to form the American Express Company, of which Wells became president and Fargo secretary. Wells, Fargo, and Company was formed in the following year to take charge of an express business between New York and San Francisco by the way of the Isthmus of Panama and also on interior lines on the Pacific coast. From 1868 to 1881 Fargo was president of the American Express Company. He was also director of the New York

Central and Northern Pacific railroads and was mayor of Buffalo from 1862 to 1866.

FAR′GUS, FREDERICK JOHN (1847–85). An English novelist (pseudonym, Hugh Conway), born in Bristol. An auctioneer by trade—it was he who catalogued and valued the Strawberry Hill collection—he did not acquire reputation as an author until 1883, when he published *Called Back*, a novel which became very popular both in Europe and America, was translated into six languages, and successfully dramatized in London. Among other works may be mentioned: *Dark Days* (1884); *Slings and Arrows* (1883); *A Cardinal Sin* (1883); *Bound Together* (1884).

FARIA E SOUSA, fȧ-rē′ȧ ē sō′zȧ, MANOEL DE (1590–1649). A Portuguese-Spanish historian and poet. He was born upon an estate near Pombeiro, in the Province of Minho, was educated at Braga, entered the service of the Bishop of Oporto, but shortly after 1613 went to Madrid. In 1631 he was attached to the Portuguese Embassy at Rome, where his talents attracted the attention of Pope Urban VIII and many learned Italians. Returning to Spain, he again made his home in Madrid, where he died. His numerous historical works, written in Spanish, include: *Epítome de las historias portuguezas* (1628); *Asia portugueza* (3 vols., 1666–75); *Africa portugueza* (1681). His poems were collected under the title *Fuente de Aganipe, rimas varias* (4 vols., Madrid, 1644–46), besides three other volumes, *Fábula de Narciso é Echo, Divinas y humanas flores*, and *Noches claras* (Madrid, 1624–26). They consist of sonnets, eclogues, canzones, and madrigals, most of them written in Spanish. About 200 of the sonnets, however, and 12 eclogues are in the Portuguese language. He is also the author of a commentary upon the *Lusiad*, which, though thoroughly uncritical, is not without interest to students of Camões.

FARIBAULT, fâr′ĭ-bō. A city and the county seat of Rice Co., Minn., 52 miles by rail south of St. Paul, at the junction of the Straight and Cannon rivers, and on the Chicago, Milwaukee, and St. Paul, the Chicago, Great Western, the Pennsylvania, and the Chicago, Rock Island, and Pacific railroads (Map: Minnesota, D 6). It has a fine location, in a region which abounds in beautiful lakes. Faribault is noted as an educational centre, having State institutions for the deaf, blind, and feebleminded, the Seabury Divinity School (opened in 1859), the Shattuck School for Boys, St. Mary's School for Girls (Protestant Episcopal), and Bethlehem Academy for Girls (Roman Catholic). There is a public library. The industrial plants include piano, wagon, shoe, gasoline-engine, nutting-truck, butter-tub, and furniture factories, and flouring and woolen mills. Faribault was settled about 1853 and incorporated about 1872. It adopted the commission form of government in 1911. The city owns and operates its water works. It was the home of Bishop Whipple, well known for his labors among the Indians. Pop., 1900, 7868; 1910, 9001; 1920, 11,089.

FARIBAULT, fȧ′rē-bō′, EUGENE RODOLPHE (1860–). A Canadian geologist. He was born at L'Assomption, Province of Quebec, and was educated at the Ecole Polytechnique and, in civil engineering and practical science, at Laval University, Quebec. In 1881 he entered the service of the Canadian Geological Survey and in 1884–1909 conducted a geological survey of the gold fields of Nova Scotia. In 1900 he was in charge of the Canadian mineral exhibit at the Paris Exhibition and was a juror representing British colonies exhibiting there. At the same exhibition he was awarded a gold medal for his model of the Goldenville gold mine and geological work in the Nova Scotia gold fields, and he received a similar award at the St. Louis Exposition in 1904. He published: *The Gold Measures of Nova Scotia and Deep Mining* (1899); *Nova Scotian Deep Gold Mining* (1903); and numerous articles in the *Annual Reports of the Geological Survey* (1885 et seq.).

FARIDKOT, fŭr′ēd-kōt′. A native Sikh state of Punjab, India, with a capital of the same name 84 miles southeast of Lahore (Map: India, B 2). Area, 642 square miles. Pop., 1901, 124,912; 1911, 130,294.

FARÍDU'D-DÍN 'AṬṬÁR, fȧ-rēd′ụd dēn ȧt-tär′ (?1120–1221). A Persian poet and mystic. He was the son of a druggist, and his real name was Muhammad ibn Ibrahim, his better-known appellation, Farídu'd-Dín 'Aṭṭár ('the pearl of the faith, the druggist'), being a poet's name, or *takhallus*. The only certainty regarding the date of his birth is that it was probably antecedent to 1150. He spent 13 years of his childhood by the shrine of the Imám Riḍá, and, after having traveled extensively in Egypt, India, and Turkestan, he returned to his native town, Níshápúr, where he spent the greater part of his life. One of his last works, a poem entitled *Madhharu'l-'Ajá'ib* ('Manifestation of Wonders'), aroused the animosity of a theologian, who caused its author to be banished as a heretic. After this 'Aṭṭár appears to have retired to Mecca, where he wrote his last work, the poem *Lisánu'l-Ghayb*, in which traces of his waning powers are evident. The date of his death is yet more or less a matter of conjecture. He studied the mystic philosophy of the Sufis and was its principal representative after his pupil Jalálu'd-Dín-i-Rúmí. His most famous work is the "Manṭiqu'ṭ-Ṭayr," or parliament of birds, an allegorical poem of 4600 couplets, according to which the birds longed for a king. As the hoopoe who had guided Solomon through the desert best knows what a king should be, he is asked whom they shall choose. "The Símúrgh in the Caucasus," is his reply. Only a few birds set out; but by the time they reach the great King's court, their number is reduced to 30. The 30 birds at length gain access to their chosen monarch, the Símúrgh; but only to find that they strangely lose their identity in his presence—that they are he, and he is they. 'Aṭṭár also wrote the *Pandnâmah*, or 'Book of Counsel,' and *The Tadhkiratu'l-Awliyâ*, or 'Memoirs of the Saints,' edited by Nicholson (London, 1905). The *Pandnâmah* has been best edited and translated by De Lacy (Paris, 1879) and has also been rendered into German by Nesselmann (Königsberg, 1871). Consult: Garcin de Tassy, *Mantic uttaïr ou le langage des oiseaux, poème de philosophie religieuse, par Farid-uddin Attar* (Paris, 1857–63); Fitzgerald, *Salâmân and Absál . . . together with a Bird's-eye View of Farid-uddin Attar's Bird-Parliament*, ed. by Dole (Boston, 1899); Geldner, "Die altpersische Litteratur," in *Die orientalischen Litteraturen* (Leipzig, 1906); Horn, *Geschichte der persischen Litteratur* (ib., 1901); Browne, *Literary History of Persia* (New York, 1906).

FARINA, fȧ-rī′nȧ *or* fȧ-rē′nȧ (Lat., flour, from *far*, coarse grain). The flour or powder of substances rich in starch, including cereal grains, as wheat and rice, leguminous seeds, as peas and beans, and roots, such as potato and arrowroot, and other like compounds. In England potato starch is exclusively known as farina. When used in America, the term "farina" generally means a granulated food product prepared from the inner portion of the finest winter wheat, although the name is occasionally employed when referring to a preparation from white maize. Farina is an important constituent of numerous prepared foods that are called farinaceous on account of the starch that they contain. It is used extensively as a breakfast cereal known as "cream of wheat" and in the preparation of puddings. In botany the pollen of flowers was formerly called farina.

FARINA, Giuseppe La. See La Farina.

FARINA, fȧ-rē̆′nȧ, Salvatore (1846–). A popular Italian novelist, with a gift for humor and for graphic portrayal of character. He was born at Sorso, in Sardinia, and studied law at Turin and Pavia, but after graduation devoted himself to a literary career and made his home permanently at Milan. For many years Farina was in charge of the literary department of the *Gazzetta Musicale.* Typical romances are: *Amore bendato* (1873); *Più forte dell' amore* (1890); and *Il signor Io* (1880), which is called his masterpiece. An autobiography in three volumes was in process of publication in 1914.

FARINATI, fä′rē-nä′tē, or Farinato, fä′rē-nä′tō, Paolo (1522–1606). A Veronese painter of the Renaissance. He was the pupil of Niccolò Giolfino and Antonio Badile, and formed his early style, in which he did much excellent work, after Brusasorci and Torbido. Later he was influenced by Paolo Veronese and Giulio Romano, and finally he sank into the mannerisms of Parmigiano and his school. His best works are amply conceived and distinguished by a warm golden tone unusual for Verona. He also produced etchings that show originality and power. Most of his paintings are in the Museum and churches of Verona; they include the fresco "St. Michael," in Santa Maria in Organo, frescoes in San Nazaro, and "The Miracle of the Loaves and Fishes" (1603), in San Giorgio. Other good examples are "St. Martin in the Cathedral of Mantua," "Presentation in the Temple" (Berlin Museum), and "Abraham and Hagar" (New York Historical Society). His son and pupil, Orazio, painted historical subjects.

FARINELLI, fä′rē-nĕl′lē, Carlo (1705–82). An Italian singer whose real name was Broschi. He was the most remarkable male soprano known, his voice being of unequaled compass, possessing seven or eight notes more than those of ordinary vocalists. When still a child, he was known all over Italy as *il ragazzo* (the boy), and from 1722 his career was one unbroken triumph. In Vienna he evoked a frenzy of enthusiasm by his dazzling feats of vocalization, but on the advice of Charles VI applied himself to sustained singing and became equally great as a dramatic singer. In London (1734) Farinelli's presence in the company of his former teacher, Porpora, then in an operatic war with Handel, caused the latter to withdraw and thenceforth to devote himself to oratorio. In Spain Farinelli's voice lightened the melancholia of Philip V. He became a great power at court and continued such until 1759, when Charles III banished him. He built himself a palace in Bologna (1761) and there lived in royal luxury. Sachi wrote a *Vita der Cav. Don Carlo Broschi, detto Farinelli* (Venice, 1784).

FARINI, fȧ-rē̆′nē, Luigi Carlo (1812–66). An Italian statesman and historian, whose name stands next to those of Garibaldi and Cavour in the long struggle for united Italy. He was born at Russi, near Ravenna, graduated in medicine at Bologna 20 years later, and for a time practiced successfully as a physician. His share in the revolutionary movement of 1843 forced him, however, to leave the Roman States and live in exile in France, until the granting of the amnesty which followed shortly after the accession of Pius IX. In 1847 he entered the Liberal cabinet as general secretary to Gaetano Rossi, the Minister of the Interior, and later became director general of the sanitary department. After the assassination of Rossi, the flight of the Pope to Gaeta, and the proclamation of the Republic at Rome, Farini withdrew to Tuscany, and upon the occupation of Rome by the French made his home in Piedmont, where he devoted himself to literary pursuits. He founded the satirical journal *La Frusta,* to support the ministry of D'Azeglio, and became attached to the staff of Cavour's *Risorgimento,* but still had time during these years to write his most noted work, *Lo stato romano dall' anno 1814 fin al 1850* (1853), which shows him a clear-sighted, even if at times a partisan, historian, and which was translated into English under the superintendence of Gladstone (1859). Having become a citizen of Piedmont, he was elected deputy to the Legislature, and in 1851 became Minister of Public Instruction in D'Azeglio's cabinet, resigning the following year. In 1859 he was sent to Modena as royal commissary, was there proclaimed Dictator, and in 1860 exerted his influence in Parma, Bologna, and Florence, in favor of a united Italy under Victor Emmanuel. In 1860 he became Minister of the Interior in Cavour's new cabinet. Later he accompanied the King to Naples and remained there as civil Governor. Upon the downfall of Rattazzi's ministry in 1862, he was asked to form a new ministry, but was soon after forced to retire, owing to failing health. His mind became affected, and he died Aug. 1, 1866, near Genoa. Besides the *Roman State* above mentioned, Farini wrote a continuation of Botta's Italian history, *Storia d' Italia dall' anno 1814 fine ai nostri giorni* (1854–59). For further details of Farini's life, consult: Bersezio, in *Contemporanei Italiani* (Turin, 1860); Mauri, in *Scritti biographichi* (Florence, 1878); Finali, in *Nuova Antologia* (ib., 1878).

FARJEON, fär′jon, Benjamin Leopold (1833–1903). An English novelist, born in London. He early went to Australia, where for a time he worked in the gold diggings. Subsequently he proceeded to New Zealand, where he wrote his first book, *Shadows on the Snow,* and in 1861 assisted in establishing at Dunedin the Otago *Daily Times,* the first daily journal published in the colony. Upon his return to London he worked as a dramatist, and in 1870 won his first success in prose fiction with *Grif.* In 1877 he gave public readings in the United States from his story *Blade-o'-Grass* (1874; new ed., 1899). Other works of his are: *Joshua Marvel* (1872); *London's Heart* (1874); *Bread and Cheese and Kisses* (1874; new ed., 1901); *The*

House of White Shadows (1884); *Samuel Boyd of Catchpole Square* (1899); *The Mesmerists* (1900); and a play, *Home Sweet Home* (1876). His skill in the development of the intricacies of a melodramatic plot has been likened to that of Wilkie Collins. His works have been translated into Spanish, Italian, French, and German.

FAR'LEY, James Lewis (1823–85). An English author, born in Dublin and educated at Trinity College in that city. Upon the formation of the Ottoman Bank in Turkey he was appointed chief accountant of the Beirut branch, which had been established by him. In 1860 he became accountant general of the State Bank of Turkey, Constantinople, which afterward became incorporated with the Imperial Ottoman Bank. He did much to establish pleasant relations between England and the Levant, and in March, 1870, was appointed Consul at Bristol by the Sultan. His numerous works on the Orient include: *Two Years in Syria* (1858); *The Druses and the Maronites* (1861); *The Resources of Turkey* (1863); *Turkey* (1866); *Turks and Christians* (1876), containing suggestions which the Porte was subsequently compelled to put into effect; *Egypt, Cyprus, and Asiatic Turkey* (1878); *New Bulgaria* (1880), one result of his holding the position of privy councilor in the Bulgarian Public Works Department.

FAR'LEY, John (Murphy), Cardinal (1842–1918). An American Roman Catholic prelate, born at Newton Hamilton, County Armagh, Ireland. He came to America after his education had begun, was a student in St. John's College, Fordham, and in St. Joseph's Seminary at Troy, and completed his theological studies at the American College in Rome. Here he was ordained in 1870, and two years later, after a pastorate in Staten Island, he became secretary to Cardinal McCloskey. He was unanimously chosen rector of the American College; but the Cardinal, unwilling to part with him, recommended him to the Pope for the honorary appointment of private chamberlain. In 1891 he became vicar-general of the archdiocese of New York, and in 1895 he was appointed prothonotary apostolic. Soon afterward he was made Assistant Bishop. Early in 1902 his name was mentioned for the post of coadjutor of the Archbishop, but the latter's death rendered necessary the appointment of a successor instead of a coadjutor. Farley was the unanimous choice, being mentioned first in the lists alike of the clergy of the diocese, the bishops of the provinces, and the archbishops of the United States. His official appointment to the see followed in October of the same year. In 1911 he was made Cardinal. He wrote a *Life of Cardinal McCloskey* (1900).

FAR'LOW, William Gilson (1844–1919). An American botanist. He was born in Boston and graduated (A.B., 1866; M.D., 1870) from Harvard University, where, after several years of European study, he became adjunct professor of botany in 1874 and professor of cryptogamic botany in 1879. In 1899 he was president of the American Society of Naturalists, in 1904 of the National Academy of Sciences, in 1905 of the American Association for the Advancement of Science, and in 1911 of the Botanical Society of America. He received the degree of LL.D. from Harvard, Glasgow, and Wisconsin. Among his publications are: *The Gymnosporangia or Cedar-Apples of the United States* (1880); *Marine Algæ of New England* (1881); *A Provisional Host-Index of the Fungi of the United States* (1888); *Biographical Index of North American Fungi* (1905).

FAR'MAN, Elbert Eli (1831–1911). An American jurist and diplomat. He was born at New Haven, Oswego Co., N. Y., and was educated at Amherst College and in Europe. He was Consul General at Cairo, Egypt, from 1876 to 1881, and a judge of the mixed tribunal from 1881 to 1884, in which capacity he displayed exceptional ability and earnestly though unsuccessfully endeavored to secure the abolition of slavery. In 1879 he arranged for the transfer to America of one of the two obelisks known by the name "Cleopatra's Needle," one now being in Central Park, New York, and the other on the Thames Embankment, London. His publications include *Along the Nile with General Grant* (1904) and *Egypt and its Betrayal* (1908).

FARMAN, fär'măn', Henri. A French pioneer in aviation and manufacturer of aëroplanes. He first attracted notice as a bicycle racer, then engaged in the manufacture of bicycles and motor cars, and finally he perfected the Henri Farman biplane. He was the second man in Europe to leave the ground in a heavier-than-air flying machine. In 1908 he flew from Châlons to Reims. In the following year he established the world record for distance of flight by flying 144¼ miles, and in the same year he broke the world record for duration of flight by remaining in the air 8 hours and 12 minutes. He was made a chevalier of the Legion of Honor in 1909. See Aëronautics, *Aviation*.

FARM BUILDINGS. The various buildings necessary for the occupation and operation of a farm are collectively known in England as the homestead, in Scotland as the onstead or steading, in America as the homestead or farmstead. They include the farmhouse with its attendant buildings providing accommodations for the farmer and his family and the farm laborers, and the barn and its attendant buildings providing for the storage and preparation for use of the farm products, storage of farm implements and machinery, the housing and care of stock, etc. Convenient, commodious, well-constructed, and well-arranged farm buildings for these purposes are essential to successful farming, both from the standpoint of the comfort and happiness of the farmer and from that of the proper care of the live stock, products, and equipment of the farm. For example, it is a generally recognized fact that well-housed animals thrive better and make a better return for the food consumed than those unduly exposed to cold and inclement weather, i.e., it is profitable as well as humane to house stock well. The investment in farm buildings is relatively smaller in the United States than in the older countries of the world, but is steadily increasing. According to the United States census of 1910, 15.4 per cent of the total capital invested in farms and their equipment was for farm buildings.

The character of farm buildings will of course vary with the size of the farm and the system of farming practiced, whether grain, truck, or fruit farming, stock raising, dairying, poultry raising, etc. The requirements as regards such buildings have undergone and are undergoing great changes due to improvements of all kinds

—the increased use of farm machinery, the keeping of more and better stock, superior methods of preparing and using feeding stuffs, etc. The most marked result of this change is seen in the tendency to make the homestead more compact, to reduce the number of separate buildings, and provide for a greater variety of purposes in a few larger buildings, as explained under BARN. The character of modern agriculture is such that farm buildings are becoming as complex in design and varied in use as factories, and indeed, in a sense, they are factories for the manufacture of marketable products—meat, milk, etc. The old practice of providing 20 or more separate buildings and scattering them over the farm is both inconvenient and expensive. The labor of collecting the crops in one place is less than is involved in passing from place to place to feed them out. The extent to which centralization is desirable, however, will depend largely upon the size of the farm. In case of very large farms, e.g., it may be of decided advantage to scatter the farm buildings somewhat. The danger of serious loss by fire is increased when the buildings are compactly grouped, but this is largely met by insurance against fire. It is not considered advisable to place the barn and outbuildings so near the farmhouse that fire in case of one necessarily endangers the other or the odors of the barnyard are offensive to the occupants of the house. However, it is important as a rule that the farmhouse should be located within a convenient distance of the barn, although not so near as to seem a part of the outbuildings. The homestead should be centrally located on the farm, in communication with as many fields as possible, and where an abundant supply of good water, good drainage, and plenty of light and air can be secured without unnecessary exposure to unfavorable weather conditions.

Three essentials to be considered in the construction of the ordinary farmhouse are comfort, convenience, and economy. It is hardly necessary to add that it is also important that the house should be attractive in appearance, with sanitary and pleasant surroundings. It should be planned with reference to future needs as well as present requirements and so designed that it may be enlarged without impairing its symmetry of proportions or convenience of arrangement. Having decided upon the general features which the house must possess, it is, as a rule, best to employ a competent architect or builder to plan and work out the details of construction. This may be said with equal truth of all other farm buildings, except those of very simple construction. In planning the barn and outbuildings, as in case of the farmhouse, the purposes for which they are to be used should be carefully considered in advance to the end that they may be conveniently arranged, of ample capacity, and may be enlarged without undue resort to annexes, lean-tos, sheds, etc. With the increased production of high-bred, high-priced stock, ventilation and sanitation of stables are second in importance only to those of dwelling houses. The large choice of building material now available makes better construction than in former years possible, although the questions of the best material for construction and best methods of ventilation and sanitation are in large part still unsolved. Among the structures forming most important additions to modern farm equipment are the silo (q.v.) and cold-storage houses and cellars.

Consult: King, *Physics of Agriculture* (Madison, 1901); Roberts, *The Farmstead* (New York, 1900); Scott, *Text-Book of Farm Engineering* (London, 1885); *Farm Buildings: Compilation of Plans* (Chicago, 1905); McConnell, *Farm Equipment: Buildings and Machinery* (London, 1910); Radford, *Practical Barn Plans and all Kinds of Farm Buildings* (Chicago, 1911) and *Practical Country Buildings* (Wausau, Wis., 1912); Curtis, *Farm Buildings* (London, 1912); Davidson, *Agricultural Engineering* (St. Paul, 1913); Hopkins, *Modern Farm Buildings* (New York, 1913); Ekblaw, *Farm Structures* (ib., 1914); Hill, "Practical Suggestions for Farm Buildings," in *United States Department of Agriculture, Farmers' Bulletin 126* (1901); C. P. Willis, "The Preservative Treatment of Farm Timbers," in *United States Department of Agriculture, Farmers' Bulletin 387* (1910).

FARM DEMONSTRATION means the demonstration of the methods of successful farming directly to men on the farms. It is essentially teaching by means of object lessons. Systems of farm demonstration have been evolved to make agricultural information immediately and positively effective and to have it reach all classes engaged in farm work. At the close of the last century itinerant agricultural demonstrators and advisers had become permanently established officials in a number of European countries, while in the United States the work has come into prominence mainly since 1900. The spread of the cotton-boll weevil in the United States gave impetus to the development of the work. With the beginning of 1904 the farmers' coöperative demonstration work was inaugurated by the United States Department of Agriculture to counteract the effect of this insect pest by improvements in cultural and other methods. A corps of field agents is in charge of the practical work which is carried on in coöperation with farmers agreeing to work the crops according to instructions to bring out the value of the methods. This work is observed and its results inspected by the farmers of the community, who are in many cases assembled for the purpose. Farm demonstration is not confined to the cotton States, but is conducted in various ways in practically all the States and often provided for under State laws. Support is given the movement by numerous agencies, such as the agricultural colleges, railroads, industrial concerns, bankers' associations, philanthropic and other organizations, and similarly interested parties. This work now stands ready to receive further Federal aid through the law providing for agricultural extension work in all the States. Consult "Demonstration Work on Southern Farms," *United States Department of Agriculture, Bulletin 422* (1910).

FARM MANAGEMENT is a branch of agriculture and applied economics treating of the business principles involved in the organization and management of farm enterprises for the greatest continuous profit. It places the operation of a farm on a business basis with a view to producing at the lowest cost and to selling to the best advantage. Farm management involves the consideration of numerous factors and their correlation and arrangement according to their logical sequence and importance. It compares the advantages and disadvantages of farming and farm life with those of other forms of business and life in the city, points out the personal qualifications required for successful farming, and outlines methods of securing land and entering upon its operation. The subject also includes the selection of the locality based on the consideration of soil, climatic, economic, and social conditions, the choice of the individual farm, and especially the adoption of the type of farming as determined by the local conditions and the economic relations of all the different lines of farm production, such as crop growing, stock raising, and the like. It deals, further, with the organization of the farm, consisting largely of the coördination of the chosen lines of work for the purpose of obtaining the most desirable distribution of labor throughout the year and of securing a maximum use of equipment and capital with a minimum outlay. This phase of the farm business exacts a study of the character, quality, and cost of equipment required and of the distribution of the necessary capital among the different factors of production and also takes into account the cost of production and the profits resulting from the various lines of work.

The most comprehensive subdivision of the entire subject of farm management is farm operation. This treats of the systems of operation as a means of conducting the farm business and points out the advantages and disadvantages of operation by the owner and his family, by the employ of hired labor, and by means of tenants. The use of the tenant system necessitates the consideration of the kind of rent, such as cash or share rent, and the character of the lease or contract between lessor and lessee. Among the numerous other topics grouped under farm operation may be mentioned the keeping of farm records and accounts, including the division of the profits of the farm between labor and capital and the determination of the comparative remunerativeness of the different lines of work, the direction of all forms of labor, the care and maintenance of equipment, the grading of live stock as to individual efficiency, the marketing of the products, and other similar subjects.

Farm management as a separate branch of agricultural science is of recent development. In the United States strictly farm-management investigations were first taken up by the agricultural experiment station of Minnesota in 1902. Shortly after, the office of farm management was organized in the Department of Agriculture, and since then the subject has received continuous attention and has spread to many of the agricultural institutions over the country. Instruction in farm management is now given in most of the State agricultural colleges, and this development has taken place since 1905. The office of farm management and the experiment stations have made numerous studies of systems of farming as followed in various sections, counties, or townships, of the capital invested, the labor and other expenses of operation, the amount and value of the products, and the net returns to the farmer and his family. Such studies have naturally led into farm accounting and estimation of the cost of production. Numerous farm-management surveys have been made for the purpose of studying the profits of the individual farmer to determine the factors controlling his income. These studies have given an analysis of the farmer's business, have shown the relative efficiency of labor under different farm conditions, and have resulted in a more intimate knowledge of the detailed practices and of the limiting factors by which they are governed and which affect their profitableness. The results of this work have made it possible to draw up plans and specifications for the organization and administration of farms and to meet increasing demands in that line. For the purpose of promoting the work in the United States the American Farm Management Association was organized in 1911. A considerable literature has grown up on the subject, consisting mainly of bulletins of the Department of Agriculture and the experiment stations. Consult: "What is Farm Management," *Department of Agriculture, Bureau of Plant Industry, Bulletin 259* (Washington, 1912); Warren, *Farm Management* (New York, 1913); "Farm Management," *Organization of Research and Teaching, Minnesota Experiment Station, Bulletin 125* (1912).

FARMER, Hugh (1714–87). An English Independent clergyman, born in St. Chad, Shrewsbury (Shropshire). He was a pupil of Dr. Philip Doddridge and from 1730 until 1780 was pastor of a church at Walthamstow, London. From 1761 to 1772 he was also afternoon preacher at Salters's Hall, and from 1762 to 1780 a preacher at the Tuesday morning "merchants' lecture." His reputation as a pulpit expositor was high. As a writer, he was considerably in advance of the theology of his time, although he never clearly defined his own position. His publications include *An Inquiry into the Nature and Design of Christ's Temptation in the Wilderness* (1761; 5th ed., 1822) and *An Essay on the Demoniacs of the New Testament* (1775; 4th ed., called the 3d, 1818). The former argued that the temptation of our Lord was a divine vision and therefore subjective; the latter, that demoniacs were merely afflicted by certain diseases. Consult Dodson, *Memoirs of the Life and Writings of the Reverend Hugh Farmer* (London, 1804).

FARMER, John (1789–1838). An American historian and genealogist, born at Chelmsford, Mass. He was a founder of the New Hampshire Historical Society. Besides editing the first volume of Belknap's *History of New Hampshire* (1831), he published a valuable *Genealogical Register of the First Settlers of New England* (1829); histories of Billerica and Amherst (1806, 1820), and, in collaboration with J. B. Moore, *A Gazetteer of New Hampshire* (1823). Consult the *Memorial of John Farmer* (Boston, 1884) by Le Bosquet.

FARMER, John Bretland (1865–). An English botanist, born at Atherstone and educated at Magdalen College, Oxford. He was fellow of Magdalen in 1889–97, demonstrator of botany in 1887–92 and assistant professor of biology in 1892–95 at Oxford, and then became professor of botany in the (London) Imperial College of Science and Technology. He was an editor of the *Annals of Botany* and wrote particularly on cytology.

FAR'MER, Moses Gerrish (1820–92). An American inventor and electrician. He was born in Boscawen (now Webster), N. H., and was educated at Andover, N. H. His early inventions included a new kind of window shade and paper curtain, and by means of machinery he was able to supply the extraordinary demand for them that soon arose. Becoming interested in electrical science he invented an electromagnetic engine and electrical locomotive. He devised the municipal fire alarm which was adopted by the city of Boston and very quickly by other cities all over the country. (See Fire

Alarm.) He moved to Salem in 1848, and became superintendent of the telegraph line from Boston to Burlington, Vt., inventing many improvements in telegraphy, among them a quadruple system by which four messages were sent simultaneously over the same wire. In 1852 he invented an electrical cooking stove. In 1855 he succeeded in electrically depositing aluminium and constructed for the Dudley Astronomical Observatory in Albany a chronograph and electrical clock. In 1856 he made an electric gyroscope so as to run continuously at uniform speed, and read a paper on multiplex telegraphy before the American Association for the Advancement of Science. In 1859 he lighted his parlor in Salem with an incandescent electric lamp, deciding, however, that a galvanic battery could not be used as a source of electric lighting. From 1864 to 1868 he experimented with alloys, and coated iron and steel wire with copper in order to combine great tensile strength with high conductivity. In 1868 he had a dynamo made with which he lighted 40 incandescent lamps in multiple arrangement. In 1872 he was appointed electrician to the United States Torpedo Station at Newport, but resigned on account of paralysis in 1881. On July 26, 1897, on the fiftieth anniversary of the exhibition at Dover, N. H., by Farmer of the first operative electric railway, the general meeting of the American Institute of Electrical Engineers was held at Eliot, Me. Here are preserved Farmer's workshop and notebooks, and here the inventor lies buried. Consult Dolbear, "Moses G. Farmer as an Electrical Pioneer," in *Electricity* (New York, 1894).

FARMER, Richard (1735–97). An English scholar and author, born at Leicester (Leicestershire). He graduated in 1757 at Emmanuel College, Cambridge, in 1760 became classical tutor of the college, and in 1775 its master. In 1778 he was elected principal librarian of the university, and in 1788 was appointed by Pitt to a residentiary prebend in St. Paul's, London. He was an intimate friend of Dr. Johnson, whom he met upon the occasion of the latter's visit to Cambridge in 1765, and of whose Literary Club he was a member. As the head of Emmanuel College, he was markedly successful, and for years he was the most influential person at Cambridge. In 1775 he became vice chancellor of the university. He is described as eccentric to a degree and supremely indolent. His only published work is the *Essay on the Learning of Shakespeare* (1767), a scholarly and most valuable demonstration of the fact that the poet's knowledge of Latin, Greek, French, Italian, and Spanish literatures was derived from English translations and references. This famous commentary has remained unsurpassed in its field. Farmer was elected a fellow of the Society of Antiquaries of London in 1763, and twice declined a bishopric proffered him as a recognition of his stout Toryism. Consult Nichols, *Literary Anecdotes of the Eighteenth Century*, vol. ii (London, 1812–15).

FARMER GEORGE. A popular name given to George III of England because of his dress, manners, and habits. He is said to have kept a farm for the small profit rather than for pleasure.

FARMERS' ALLIANCE. A political party in the United States, which became of national importance in 1890, especially in the South and West. The movement originated as far back as 1873 and after the decline of the Grange (q.v.) succeeded it in importance and, in general, in principles also. It was especially strong in Texas, and kindred societies grew up in other States, such as the Wheel in Arkansas, founded in 1882, and the Farmers' Union in Louisiana. In 1887 a national alliance was formed out of several State societies, and its political character soon became marked. Meetings were held in 1888 and in 1880, and at the latter a platform of principles was agreed upon by the Alliance and the Knights of Labor, and the name became National Farmers' Alliance and Industrial Union. The platform demanded the abolition of national banks, increased issues of legal-tender greenbacks, laws against dealings in futures of agricultural and mechanical products, free and unlimited coinage of silver, and government ownership of all means of transportation and intercourse. In the South the Alliance demanded the establishment by the government of subtreasury warehouses where farmers could deposit their products and receive currency in exchange, and also the opportunity to borrow money from the government at nominal interest. In the campaign of 1890 the Alliance in the South did not put forth separate candidates, but dictated the nominations of the Democratic party, especially in South Carolina. In the West there were separate nominations. The election gave the Alliance the control of the legislatures of Kansas and Nebraska, and the balance of power in Illinois, Minnesota, and South Dakota. It sent nine men to the House of Representatives, and Senators from Kansas, South Dakota, and South Carolina, but the latter was called a Democrat. In 1892 the organization united with other elements and formed the Populist party (q.v.), nominating a President. This was not done without a split in the Alliance, however, most of the Southern members refusing to leave their old political connections. The new party continued the demand for the subtreasury scheme, free silver, more greenbacks, and public ownership of means of communication and transportation. The Alliance ceased to be a political party, but continued as an agricultural organization. United with several similar organizations into a Farmers' National Congress, in 1914 it represented something over 3,000,000 farmers. It urged Federal aid for inland communications, a head tax and illiteracy test for immigration, protection for coöperative enterprises, and opposed ship subsidies, free distribution of seed, and interstate liquor traffic into dry territory. See Woodburn, *Political Parties* (2d ed., New York, 1914).

FARMER'S ALLMINAX, The. An annual publication, from 1869 to 1880, by Josh Billings (Henry Shaw). It parodied the old *Farmers' Almanac* and became very popular. Its sales reached several hundred thousand copies.

FARMER'S BOY, The. A famous poem by Robert Bloomfield, published in 1800.

FARMERS-GENERAL (Fr. *fermiers-généraux*). The name given to the members of a privileged association in France, who farmed or leased the public revenue of the nation under the old régime. This peculiar system of tax gathering dated from the early fourteenth century, when the *gabelle*, or salt tax, was farmed out in order to raise money for the war against England. In time other taxes were instituted and farmed out, until in the year 1720 there was a special administrative board formed, presided over by one of the farmers-general or by one of his assistants for each class of imposts. The Minister of Finance selected the farmers-general at his pleasure, but his choice was generally influenced by bribes (*pot-de-vin*). The royal favorites were frequently given control of various imposts in lieu of pensions. The number of farmers-general was ordinarily 40, but shortly before the Revolution it had risen to 60. The annual national revenue to be collected was fixed at a certain amount, and all returns above this sum went into the pockets of the farmers-general, many if not most of whom accumulated large fortunes, though names like those of Helvetius, Dupin, and Lavoisier indicate that they were not all personally corrupt. Those in power were bribed to support this corrupt and ruinous financial system, though Turgot and Necker sought to change it. The constitution of 1791 did away with the farming of the revenues, while the Revolutionary Tribunal sent many of the ex-farmers-general to the guillotine. Consult: C. Gomel, *Les causes financières de la révolution française* (2 vols., Paris, 1892–93); R. Stourm, *Les finances de l'ancien régime et de la révolution* (2 vols., ib., 1885); De Nervo, *Les finances françaises sous l'ancienne monarchie, etc.* (ib., 1863); Lemoine, *Les derniers fermiers-généraux* (ib., 1873); Vuitry, *Etudes sur la régime financier de la France avant le révolution de 1789* (ib., 1883); Bouchard, *Système financier de l'ancienne monarchie* (ib., 1891); Tocqueville, *France before the Revolution of 1789* (Eng. trans., London, 1888); Taine, *The Ancient Régime* (Eng. trans., ib., 1876); Lowell, *The Eve of the French Revolution* (Boston, 1892).

FARMERS' INSTITUTE. A meeting of farmers for mutual improvement in their business or home life. These meetings have grown out of the public meetings held at a comparatively early day in the United States under the auspices of local or State agricultural societies. The institutes are carried on under varied auspices and are supported in very different ways in different sections, but the character of the meetings themselves is essentially the same everywhere. They may last but half a day, as in Louisiana, where the farmers assemble once a month at the experiment stations, or may continue three or four days. The winter, when the stress of farm work is somewhat lessened, is the season usually favored; but in some States very successful meetings have been held at other seasons of the year.

In practically all the States and Canada the farmers' institutes are now organized, with a director or other officer in charge, and enjoy State appropriation. They are commonly under the management of the agricultural colleges. Great improvement in these meetings has been made in recent years, and they are no longer experience meetings or for political purposes, but are in the hands of capable speakers. The programmes are planned to promote the interchange of ideas, a full and free discussion being sought upon topics introduced in an address or paper by some specialist. Officers of agricultural colleges and experiment stations, and other experts, as well as successful farmers who have attained more than local reputation, are usually selected as institute workers by those who have charge of the system of institutes for the State. These workers may also be chosen by the local authorities from lists of such workers prepared by a central bureau. The local committee invites successful farmers of the neighboring districts to explain their methods, provides music and literary or other general exercises, and arranges for the place of meeting, refreshments, and advertising. A "question box" is frequently made use of, answers being given by the conductor of the institute, or by some one specially fitted to supply the information asked for. For the evening sessions the usual plan is to have a popular lecture upon some subject of general agricultural interest. This address is made somewhat more elaborate and complete than those of the day sessions, and less opportunity is given for discussion.

While the character of the institutes is such as to make it impossible to assign any definite date as the time of their differentiation from other farmers' assemblies, yet the period following the organization of the agricultural colleges under the Morrill Act of 1862 seems to have been the time when the farmers' institutes took a distinct form and under that name began to receive the patronage of the States. Thus, in 1862 the Massachusetts State Board of Agriculture held a public meeting of four days' duration, and in 1866 the Connecticut State Board of Agriculture held its first farmers' convention for lectures and discussion. In 1870 the newly organized State Board of Agriculture of New Hampshire began a series of farmers' meetings, and in the following year Vermont followed this example. During the same year the Massachusetts board requested the 29 agricultural socieites of the State to organize annual meetings, to be denominated the "Farmers' Institutes of Massachusetts," and several societies began at once to hold such meetings. About the same time institutes were inaugurated in Iowa, Kansas, and Michigan by the agricultural colleges of those States. Other States soon joined the movement, and legislatures began to make appropriations to maintain the institutes. In 1885, when the board of regents of the University of Wisconsin organized a course of institutes, a special officer, called the superintendent of farmers' institutes, was appointed to plan and manage them, and this arrangement was afterward confirmed by the State.

Recent advancements under the head of farmers' institutes are the movable school that offers short courses of instruction to farmers and farm women, the young peoples' institutes, and courses of instruction adapted to correspondence teaching. The United States Department of Agriculture has collected publications and other materials for the use of farmers' institute workers and has prepared lectures illustrated by lantern slides, which are loaned to speakers or to institute organizations. In Canada the system is also highly developed. In 1913 a total of 7926 regular institutes were held in the United States, representing an aggregate of 10,578 days. In addition to the regular institutes there were 187 movable schools, 25 educational trains, nearly 800 independent institutes, and 66 "round-up" institutes. It is estimated that the total attendance at these various gatherings was practically 4,000,000 people. The funds available for farmers' institutes in the various States amounted to $510,784. In the past 10 years there has been an increase of 115 per cent in the number of sessions held, an increase of over 300 per cent in attendance, and an increase of 175 per cent in appropriations. The interests of the institutes are promoted by the American Association of Farmers' Institute Workers, and by the Office of Experiment Stations of the United States Department of Agriculture, Washington, D. C. Consult: J. Hamilton, "History of Farmers' Institutes in the United States," *United States Department of Agriculture, Office of Experimental Stations, Bulletin 174;* J. Hamilton, "Legislation Relating to Farmers' Institutes," *Bulletin 241;* and "Farmers' Institute and Agricultural Extension Work in the United States in 1913," *United States Department of Agriculture, Bulletin 83.*

FARMER'S LETTERS. A series of twelve letters, ostensibly by a farmer, which appeared in 1767. Their author was soon discovered in John Dickinson, a prominent Pennsylvanian. They were political tracts, denouncing the taxation of the Colonies by Parliament without their consent, and had great influence in shaping public opinion.

FARMING. See Agriculture.

FARM′INGTON. A borough in Hartford Co., Conn., 9 miles west of Hartford, on the New York, New Haven, and Hartford Railroad (Map: Conn., D 3). It is situated in a farming and fruit-growing district. The borough contains Sarah Porter's Seminary for Young Ladies. Pop., 1900, 3331; 1910, 3478.

FARMINGTON. A town and the county seat of Franklin Co., Me., 47 miles north of Lewiston, on the Maine Central and the Sandy River railroads (Map: Maine, B 4). It has the Farmington State Normal School and the Abbott School for Boys and a public library. Among the industrial establishments are machine shops, lumber and grist mills, wood-turning shops, carriage works, and canning factories. The water works are municipally owned. Pop., 1900, 3288; 1910, 3310.

FARMINGTON. A city and the county seat of St. François Co., Mo., 58 miles (direct) south by west of St. Louis, on the St. Louis, Iron Mountain, and Southern and the Cape Girardeau Northern railroads (Map: Missouri, F 4). Carleton Institute (M. E.), Elmwood Seminary (girls), and a State insane asylum are situated here. It is the centre of a productive lead-mining region and has carriage and wagon works, lumber mills, machine shops, flouring mills, etc. The water works and electric-light plant are owned by the city. Pop., 1900, 1778; 1910, 2613.

FARM′VILLE. A town and the county seat of Prince Edward Co., Va., 53 miles (direct) west-southwest of Richmond, on the Appomattox River, and on the Norfolk and Western and the Tidewater and Western railroads (Map: Virginia, F 4). The State Female Normal School, established in 1884, is situated here, and in the vicinity is the Hampden Sidney College for Young Men. Farmville is in a fertile agricultural region, is an important tobacco-manufacturing centre, and has medicinal springs. There are plow-handle and overall factories and a creamery. The water works and electric-light plant are owned by the town. Pop., 1910, 2971.

FAR′NABY, or **FARNABIE,** Thomas (c.1575-1647). An English schoolmaster and classical scholar, born in London and educated at Oxford. He was converted to Catholicism, and received a further classical training at a Jesuit college in Spain. He was the companion of Sir Francis Drake and John Hawkins on their last voyage, was engaged in military service in the Low Countries, and finally became established at Martock, Somersetshire, where he opened a school which subsequently was removed to London, and there enjoyed the patronage of the aristocracy and was attended by more than 300 pupils. Many eminent clergymen and statesmen received their education here, and before 1629 the school had acquired a European reputation. Upon the outbreak of the plague in 1636 it was removed to Otford, an estate which Farnaby had bought in Kent. The publications of Farnaby include annotated editions of many Latin authors—Juvenal, Persius, Seneca (the tragedies), Martial, Lucan, Ovid, Vergil, Terence, all long popular—and a *Systema Grammaticum* (1641), or Latin grammar, written at the request of Charles I and designed to replace the one previously in use in the public schools.

FAR′NAM, Henry Walcott (1853-). An American economist, born at New Haven, Conn. He graduated from Yale (A.B., 1874; A.M., 1876) and studied at Berlin, Göttingen, and Strassburg (R.P.D., 1878) universities. After two years as tutor he became professor of political economy at Yale College in 1880; from 1881 to 1903 he also held the corresponding chair at Sheffield Scientific School (Yale). In 1914-15 he was Roosevelt professor at the University of Berlin. He was associate editor of the *Yale Review* from 1892 to 1911, when he joined the staff of the *Economic Review;* chairman of the New Haven Civil Service Board (1898-99) and of the State Commission of Sculpture (1887-1909), and in 1903 became collaborator and in 1909 chairman of the department of economics and sociology in the Carnegie Institution. He was president of the Connecticut Civil Service Reform Association after 1901, of the American Association for Labor Legislation in 1907-10, and of the American Economic Association in 1910-11, and in 1909 became a vice president of the American Statistical Association. He published *The Economic Utilization of History* (1913).

FARNBOROUGH, färn′bŭr-ō. A town in Hampshire, England, on the Blackwater, near the Basingstoke Canal, about 33 miles southwest of London. It is famous for its strawberry gardens, cultivated for the London market. In the neighborhood is Farnborough Hill, long the residence of ex-Empress Eugénie, with the mausoleum containing the tombs of Napoleon III and the Prince Imperial. Farnborough is one of the stations for Aldershot Camp. The main depot of the British Royal Aircraft factory, in connection with the Royal Flying Corps, is at Farnborough. Pop., 1901, 11,500; 1911, 14,199.

FARNBOROUGH, Lord. See May, T. E.

FARNE, färn, **FEARNE,** or **FERN ISLES,** or The Staples. A group of 17 islets and rocks, some of which are visible only at low tide, 2 to 5 miles off the northeast coast of Northumberland, opposite Bamborough, England (Map: England, E 1). The largest island, Farne, or House, has an area of about 16 acres and is separated from the coast by the Fairway, 1½ miles broad. Here are the ruins of a chapel believed to mark the site of the hermitage of St. Cuthbert, who lived here for two years and returned here to die. Longstone Rock and its lighthouse are famous as the scene of Grace Darling's heroism in 1838, when the *Forfarshire* was wrecked. There are two lighthouses.

FAR′NELL, Lewis Richard (1856-). An English archæologist and writer on religion. He was born in Salisbury; studied at the City of London School and at Exeter College, Oxford, of which he became fellow in 1880, classical lecturer in 1883, subrector in 1884, and senior tutor in 1893; and was University lecturer in classical archæology, the first Wilde lecturer in comparative religion (1909), and Hibbert lecturer in 1911. His important studies on religion, especially Greek, include the epoch-making *Cults of the Greek States* (5 vols., 1896–1909), *The Evolution of Religion* (1905), and *Greece and Babylon* (1911).

FARNESE, fär-nā'sā. The name of an illustrious Italian family, first mentioned in the middle of the thirteenth century, when it possessed the castle of Farneto, near Orvieto. The power of the family dates from the time of Pope Alexander VI, who was the lover of Giulia Farnese and alienated many of the lands belonging to the holy see for her benefit. In 1534 Cardinal Alessandro Farnese was raised to the papal throne as Paul III (q.v.), and as his great aim was the aggrandizement of his family, he erected Parma and Piacenza into a duchy, which he bestowed on his natural son, Pietro Luigi. Pietro was assassinated in 1547 by the nobles and imperialists whom he had opposed, and was succeeded by his son Ottavio (1520–86), who married Margaret of Austria, a natural daughter of Charles V, and the greater part of whose reign was both peaceful and prosperous.—Alessandro Farnese, Prince of Parma and Spanish Governor in the Netherlands, was the son of Ottavio and was born in 1547. After being educated at the royal court at Madrid, he entered the Spanish service, made his first campaign under his uncle, Don Juan of Austria, and distinguished himself at the battle of Lepanto in the year 1571. In 1577 he was sent with reënforcements to Don Juan in the Low Countries, then in a state of insurrection, and contributed to the victory at Gembloux, Jan. 31, 1578. He was next made Governor of the Spanish Netherlands by Philip II and carried on the war against the Prince of Orange. By skillful diplomacy more even than by his military talents Farnese succeeded in winning back the Walloon provinces and several important towns. The assassination of William the Silent in 1584 aided his cause, and in 1585 he was able to reduce Antwerp after a memorable siege; but the project of the Armada (q.v.) interfered with his conquests in the Low Countries, and the ill success of the expedition against England, in which he had been given the command of the troops destined for the invasion of that country, grieved him the more from the contrast it presented to his former good fortune. In 1590 he was dispatched to the assistance of the Catholics in France and compelled Henry IV to raise the siege of Paris. Being, however, ill supplied with provisions and money and insufficiently supported by the League, he was forced to yield to the superior power of Henry IV and withdrew his forces. In 1591 he was once more forced to relinquish the conquest of the Netherlands and embark on a French campaign. After raising the siege of Rouen he was again compelled to withdraw. Returning, in spite of shattered health, in 1592, he died suddenly at Arras, December 2. Alexander Farnese was one of the great generals of his age and, though severe in his discipline, was almost worshiped by his soldiery.—Ranuccio (1569–1622), his son and successor in the Duchy of Parma, was sombre, greedy, and proud. He was succeeded by his second son, Odoardo (1612–46), a prince remarkable for the elegance of his manners, his magnificence, magnanimity, and liberality.—Elizabeth Farnese (1692–1766), the daughter of Odoardo II, married, in 1714, Philip V of Spain. Of a domineering and ambitious nature, she completely ruled the King. She involved Alberoni (q.v.) in her aggressive policy, the object of which was to establish her sons, Carlos and Philip, over principalities in Italy. The male line of the Farnese family became extinct in the person of Antonio, who died in 1731.

The name of the Farnese family is connected with several celebrated palaces and works of art. The principal ones are: 1. The Farnese Palace at Rome, one of the finest specimens of Roman Renaissance architecture and one of the finest palaces in Rome, erected by Pope Paul III before his accession to the holy see, after the designs of Antonio da Sangallo. It is in the form of a quadrangle and was completed by Michelangelo. The antique sculptures for which it was formerly renowned are now in the museum at Naples; a few classic works, however, are still to be seen in the great hall. 2. The Farnesina (or Villa Farnese), a magnificent palace in Trastevere, Rome. It owes its celebrity chiefly to the frescoes of Raphael; but it also contains frescoes by Peruzzi and Sebastian del Piombo, and a colossal head in chiaroscuro, attributed to Michelangelo. 3. The Farnese Bull is the name given to a colossal group attributed to Apollonius and Tauriscus of Tralles, in Asia Minor, who probably belonged to the Rhodian school and lived about 300 B.C. The group represents Dirce bound to the horns of a bull by Zethus and Amphion, for ill usage of their mother, Antiope. Pliny mentions the transference of the group to Rome, where it first adorned the library of Asinius Pollio and afterward the baths of Caracalla. It was discovered in the year 1546, restored by Bianchi, and placed in the Farnese Palace. 4. The Farnese Hercules, copied by Glycon from an original by Lysippus. It exhibits the hero, exhausted by toil, leaning upon his club, the head inclined, the expression melancholy; one hand is held behind his back, grasping the apples of the Hesperides.

For the early history of the Farnese family and their part in the Renaissance, consult: Symonds, *The Renaissance in Italy* (7 vols., London, 1875–86); Gregorovius, *Geschichte der Stadt Rom* (Stuttgart, 1886–96; Eng. trans., London, 1894–1900); also the works of Muratori and of the Italian biographer Strada. For Alessandro Farnese, the accounts given in Motley, *Rise of the Dutch Republic*, and id., *The United Netherlands;* Blok, *Geschiednis von het nederlandsche Volk* (Gröningen, 1892–99; Eng. trans., New York, 1898–1900); Pietro, *Alessandro Farnese, duca di Parma* (Rome, 1886); Gachard, *Correspondance d'Alexandre Farnese avec Philippe II, 1578–79* (Brussels, 1853). For the history of the dukes or princes of Parma, Scarabelli, *Storia civile dei ducati di Parma* (Piacenza, 1858); Pezzano, *Storia della città di Parma* (Parma, 1837–59); Marq. de St.-Philippe, *Mémoires pour servir à l'histoire d'Espagne sous le regne de Philippe V* (Paris, 1756); *Memoirs of Elizabeth Farnese* (London, 1796); Lita, *Famiglie celebri Italiane* (Milan, 1868); Von Reumont, *Geschichte der Stadt Rom* (Berlin, 1868); Lottice and Sitti, *Bibliografia generale per la storia parmense* (Parma, 1904). For Elizabeth Farnese, Armstrong, *Elizabeth Farnese, the Termagant of Spain* (London, 1892).

FARNESE HERCULES. A statue of Hercules, which is now in the Naples Museum. It got its name from the Farnese family, in whose possession it was for some time after its excavation at the baths of Caracalla. It dates from the first century B.C., and is an imitation, by the Athenian sculptor Glycon, of one of the bronzes by Lysippus. The statue shows Hercules leaning on his club in an attitude of exhaustion and holding the apples of the Hesperides behind him in his right hand. The muscles of the back and arms are enormous; the legs are too long, and the head unduly small, the whole effect of the statue being one of exaggeration common to this period of declining Greek art.

FARNESE JUNO. A colossal head of Hera in the National Museum at Naples, the copy of a bronze original of austere and majestic mien. The head surpasses all like conceptions of the goddess and gives a clear idea of the ideal of Polyclitus (q.v.).

FARNE'SIAN BULL. A group of sculpture by the brothers Apollonius and Tauriscus of Tralles, who flourished in the second century B.C. The subject is based on the legend which tells how Antiope, a slave of Dirce, was to be bound to the horns of a wild bull by order of her mistress. She fled to her sons, who seized Dirce herself and bound her to the bull. The arrangement of the group shows Zethus and Amphion, the sons, in this act, while their victim, who lies on the ground, vainly entreats mercy, and Antiope stands motionless in the background. The statue was taken from Rhodes to Rome, was there lost for several centuries, then found in the baths of Caracalla, and sent in 1786 from the Farnese Palace to the Museum at Naples. Excepting the Laocoön (q.v.), this is the most important surviving work of the sculpture of the Rhodian school, of which it is a typical example, in exaggerated sentiment as well as in ostentatious display of technical skill.

FARNESOL, fär'nê-sōl *or* -sŏl. A liquid alcohol contained in quassia, palmarosa, and Javanese cananga oils and in Peru and tolu balsams. It is nearly as heavy as water and can be distilled under greatly reduced pressure.

FARNHAM, färn'ăm. A market town of Surrey, England, on the left bank of the Wey, about 37 miles southwest by west of London (Map: England, F 5). The principal feature is the stately old castle of the bishops of Winchester, first built by Henri de Blois, Bishop of Winchester, brother of King Stephen. The castle was razed by Henry III, rebuilt and garrisoned by Charles I, and restored in 1684 to its present state by Bishop Morley. A new town hall was erected in 1666. Some parts of the Gothic parish church were built in the twelfth, fifteenth, and sixteenth centuries. The edifice was originally a chapel of ease to Waverley Abbey, founded in 1128. The *Annales Waverliensis*, included by Gale in his *Scriptores*, are said to have suggested to Sir Walter Scott the name of his first novel. The town owns its water works and electric-lighting plant. The chief trade is in hops, a very fine variety of which is grown in the vicinity. William Cobbett was born and buried here, and it was the home of Hester Johnson, Swift's "Stella." The vicinity of Aldershot Camp, 3 miles northeast of Farnham, has increased the activity of the town. Farnham has belonged to the bishops of Winchester since Ethelbald of Wessex bestowed it on them in 860. Pop., 1901, 6124; 1911, 7365.

FARNHAM, or West Farnham. A town of Missisquoi Co., Quebec, Canada, at the confluence of the two main branches of the Yamaska River, 43 miles by rail east-southeast of Montreal, on the Canadian Pacific and the Vermont Central railroads (Map: Quebec, F 5). The Canadian Pacific Railway forms a junction here with various branch lines. Farnham has fine public buildings, including a spacious railway station. It contains a Roman Catholic college and convent and a hospital. Divisional shops of the Canadian Pacific Railway are located here. The industries include butter and cheese factories, builders' factories, a saw and a grist mill, tannery, furniture factory, tobacco factory, safe factory, machine shop, marble works, and sash and door factories. Pop., 1901, 3114; 1911, 3560.

FARNHAM, Eliza Woodson Burhans (1815–64). An American philanthropist and author. She was born in Rensselaerville, N. Y., and married Thomas Jefferson Farnham the traveler. From 1844 to 1848 she was matron of the Sing Sing State prison. While there, she sought with much success to prove it possible to govern such an institution by kindness only. She published *Life in Prairie Land* (1846). In 1848 she was connected with the management of the Boston Institution for the Blind and some years later organized a society to aid and protect destitute women in emigration to the West. Her further publications include: *California Indoor and Out: or, How we Farm, Mine, and Live Generally in the Golden State* (1856); *My Early Days* (1859), and her most important work, *Woman and her Era* (1864).

FARNHAM, Ralph (1756–1861). A soldier in the American Revolution, the last survivor of the battle of Bunker Hill. He was born in Lebanon, Me., and was the first white settler at Acton, Me., where he died at the age of 104 years, 9 months, and 19 days. In October, 1860, he was invited to Boston, where a public concert was given in his honor in Tremont Temple.

FARNHAM, Roswell (1827–1903). An American lawyer and governor. He was born in Boston, Mass., and graduated at the University of Vermont in 1849. He taught school for several years, studied law, and was admitted to the bar in 1857. After serving in the Civil War as captain and colonel in a Vermont regiment, he was elected as a Republican to the State Senate in 1868. He was Governor of Vermont from 1880 to 1882.

FAR'NUM, Dustin (1876–). An American actor, born at Hampton Beach, N. H. He first appeared in 1897 with the Ethel Tucker Company in *The Hidden Hand.* After spending 18 months with Margaret Mather's company and two seasons with Chauncey Olcott, he played the part of Lieutenant Denton in *Arizona*, the title rôle in the *Virginian* (1904), and appeared as Captain Esmond in *The Ranger* (1907) and as Dr. Prince in *The Rector's Garden* (1908). He toured in *The Squaw Man* in 1909, played in *The Littlest Rebel* in 1911, and reappeared in *Arizona* in 1913.

FARNUM, William (1876–). An American actor, brother of Dustin Farnum, born in Boston. He made his début at Richmond, Va., in *Julius Cæsar*, then played in a stock company at Boston, and toured with Margaret Mather and Olga Nethersole. His success in *Ben Hur* and *The Prince of India* (1907) was noteworthy. He played in *Society and the Bull-*

dog (1908), and appeared in *The Littlest Rebel* in 1911.

FARN'WORTH. A town of Lancashire, England, 3 miles south-southeast of Bolton-le-Moors and 15 miles northwest of Manchester. It is a junction station on the Manchester and Bolton Railway and is an important industrial centre, with manufactures of cotton, brick, and tile, and iron foundries. The town owns its tramway and electric-lighting service, market, baths, etc. It has a notable chapel, a picturesque embattled building of the fifteenth century. Pop., 1901, 25,900; 1911, 28,131.

FARO, fä'rô. A seaport of Portugal in Algarve, capital of the district of its own name, situated on the south coast, 140 miles southeast of Lisbon (Map: Portugal, B 4). It has a partly ruined Moorish castle surrounded by old walls, a fine cathedral, a number of convents, and a seminary, a military hospital, and a military school. The harbor, at the mouth of a small river and protected by islands, is spacious, but not very deep. The town has, nevertheless, an active trade in fruits, oil, sumach, anchovies, wine, cork, etc. There are deposits of salt and antimony in the vicinity. Faro was recovered from the Moors in 1260. It was sacked in 1596 by the English and has suffered severely from earthquakes, notably in 1722 and 1755. Pop., 1890, 9338; 1900, 11,835; 1911, 12,680. Faro is the name, also, of an administrative district which corresponds with the ancient Kingdom (later, Province) of Algarve, with a population in 1911 of 272,861.

FARO, fä'rô. A game played with ordinary playing cards, by any number of persons, for purely gambling purposes. In the form commonly played in the United States a full pack of cards is shuffled and placed face upward in a "dealing box." One card at a time is drawn from the top of the pack, and the uppermost card is always in sight. The "layout" consists of 13 cards of a suit, reproduced by painting them on a strip of cloth, or on a table, in two parallel horizontal rows. The upper row comprises the king, queen, jack, ten, nine, and eight, and under these cards are placed, in order, the ace, deuce, tray, four, five, and six, the seven being placed at the dealer's right and midway between the rows. In certain States of the United States which have legislated against this particular form of the game, it has been slightly altered—e.g., in certain of the Southern States, by eliminating the seven. By means of the layout the better attempts to predict the order in which the cards will be drawn from the box by the dealer. One of the players may "keep cases" on the game, by means of a "case box," which is a contrivance of buttons strung on wires and so arranged that a record may be kept of every card played; or the score may be kept by one or more of the players by means of "cue cards" on which the plays are noted with a pencil.

FAROE (fä'rô *or* fä'rô-e) **ISLANDS** (Dan. Färöerne). A group of islands, 21 in number, of which only 17 are inhabited, belonging to Denmark, and lying nearly midway between the Shetlands and Iceland, extending from lat. 61° 25′ to 62° 25′ N., and from long. 6° 20′ to 7° 40′ W. (Map: Denmark, Insert). The principal island, Strömö (capital, Thorshavn), is 27 miles long and 8 miles broad; those next in importance are Kalsö, Osterö, Vaagö, Bordö, Viderö, Sandö, and Suderö. Area, 530 square miles. They are mostly volcanic with basaltic formations covered with a thin vegetable soil, which yields pasturage for cattle and sheep. The highest point, Slattarindur, is 2875 feet. There is a lack of streams, but small fresh-water lakes are numerous. The coasts, which are steep and lofty, are broken by deep inlets, which are full of dangerous whirlpools and currents. Hurricanes, which prevail, prevent the growth of trees and hinder the cultivation of most of the ordinary vegetables and cereals; considering the latitude, the climate is mild, and snow rarely lies long on the ground. The annual rainfall is about 70 inches. Coal and peat are found, and there are also traces of iron, copper, and chalcedony, but the chief sources of wealth are the sheep and sea fowl which frequent the rocks. Opals are also found. Fishing is an important industry: also the making of coarse woolen goods. Exports consist mainly of tallow, train oil, feathers, skins, wool, fish, and butter. The people are of Norse descent—a vigorous, thrifty race, mostly Lutherans. They are governed by a Lagthing consisting of 18 members elected for four years and presided over by a Danish governor. The islands are represented in the Danish Parliament by two representatives selected by the people—one directly and the other through the local government. The islands were held by Norway until the latter part of the fourteenth century, when they were shared with Denmark, which became sole owner in 1814. The language of the people is only a slightly modified form of the old Norse. Pop., 1901, 15,230; 1911, 18,000. Consult Jeaffreson, *The Faroe Islands* (New York, 1901), and Annandale, *The Faroes and Iceland* (Oxford, 1905).

FARQUHAR, fär'kwẽr, GEORGE (1678–1707). An English dramatist. He was born at Londonderry, Ireland, and entered Trinity College, Dublin, in 1694, but left without a degree. He was then engaged as an actor by one of the Dublin theatres. Playing the part of Guyomar in Dryden's *Indian Emperor*, he accidentally wounded a brother performer and was so shocked by the occurrence that he at once quitted the boards. Accompanied by the actor Wilkes, he proceeded to London, and shortly afterward received a commission in the regiment commanded by the Earl of Orrery, which was then stationed in Ireland. Urged by Wilkes, he produced in 1699 his first comedy, entitled *Love and a Bottle*, which proved a success. The next year appeared his *Constant Couple*, which met with a brilliant reception, and to which he wrote a sequel called *Sir Harry Wildair* (1701). In 1702 he produced *The Inconstant*, founded on the *Wild-Goose Chase* of Beaumont and Fletcher—a version in which all the coarseness and none of the poetry is retained. This was followed by *The Twin Rivals* (1702); *The Stage Coach* (1704); and a fine military comedy called *The Recruiting Officer* (1706). He had married in 1703, and, falling into serious pecuniary difficulties, he sold his commission. He felt his poverty keenly, but nevertheless during his last illness wrote the best of his plays, *The Beaux' Stratagem* (1707), it is said, in six weeks. His death was hastened, if not directly caused, by his chagrin at not receiving a captaincy promised him by Ormonde. Farquhar is one of the finest of our comic dramatists, although Pope called him a "farce writer." Less brilliant than Congreve, he possessed more warmth and a wider range of character. He had wit in abundance, but he had humanity too. As a man he was tender-hearted and somewhat given to melancholy. Consult *Dramatic Works*, edited, with *Life*, by Ewald (London, 1892), and *Farquhar* (New York, 1907), a volume of selected plays edited by William Archer.

FARQUHAR, Norman von Heldreich (1840–1907). An American naval officer, born at Pottsville, Pa. He graduated at the United States Naval Academy in 1859, was assigned to the squadron stationed off the African coast for the suppression of the slave trade, and during the Civil War served in the North Atlantic blockading squadron. He participated in both attacks on Fort Fisher, was commissioned lieutenant commander in 1865, became commodore in 1897, and subsequently rear admiral. He was in command of the *Trenton*, of the Pacific station, when that vessel was wrecked during the great hurricane at Apia, Samoa (March 16, 1889). In 1889 he was appointed to the Lighthouse Board, in 1890 became chief of the bureau of yards and docks in the United States Navy Department, and in 1899 commander of the North Atlantic station. He was retired in 1902.

FARQUHARSON, fär′kwẽr-son, Martha. See Finley, Martha.

FARR, William (1807–83). An English statistician. He was born in Shropshire, was educated at the universities of Paris and London, and afterward gave his attention to medical statistics. A registration of deaths and their causes was commenced in England in 1837, and two years later Farr was made superintendent of the statistical department. He assisted in the census of 1841, acted as assistant commissioner of the census in 1851 and 1861, and was commissioner in 1871. A selection from his works, under the title *Vital Statistics*, was published in 1885. In addition, he published many essays and monographs on statistical subjects.

FARRAGUT, făr′a-gŭt, David Glasgow (1801–70). The most famous of American naval officers. He was born at Campbell's Station, near Knoxville, Tenn., on July 5, 1801, the son of George Farragut (1775–1817), a native of Minorca, who had emigrated to the United States in 1776 and had taken an active part in the Revolutionary War. In 1808 the future admiral was adopted by Commander (later Commodore) Porter, and in December, 1810, entered the navy as a midshipman. He was assigned to the *Essex* (Captain Porter) in the same year, accompanied this vessel on its famous cruise in the Pacific (1812–14), and on March 28, 1814, distinguished himself in the bloody battle with the English vessels the *Phœbe* and the *Cherub*. He then served successively on the *Independence* and the *Macedonian* in the Mediterranean (1815–17), studied for nine months under Charles Folsom, United States Consul at Tunis, became acting lieutenant on the *Shark* in 1819, was placed in command of the *Ferret* in 1823, and in 1825 became lieutenant on the *Brandywine*. For the next 12 years he served in subordinate capacities on various vessels and in various parts of the world, but in 1838 was placed in command of the sloop *Erie* and in 1841 was raised to the rank of commander. During the Mexican War he commanded the sloop of war *Saratoga*, in Commodore Perry's squadron, and maintained a strict blockade of the port of Tuxpan. He was on duty at the Norfolk (Va.) Navy Yard from 1848 to 1850, when he went to Washington to help compile a book of ordnance regulations for the navy, and from 1854 to 1858 was engaged in establishing the Mare Island Navy Yard, in San Francisco Bay. In 1858–59 he was commander of the sloop of war *Brooklyn* and in 1860–61 was again stationed at the Norfolk Navy Yard. Though bound to the South by birth and by the strongest of family ties, he remained steadfastly loyal to the Union at the time of the Civil War, and when Virginia seceded he removed from Norfolk to Hastings-on-the-Hudson and offered his services unreservedly to the Federal government. He served for several months on the Naval Retiring Board, but in December, 1861, was put in command of the West Gulf blockading squadron of 17 vessels, which, with a mortar flotilla of 25 vessels, under Commander (later Admiral) David D. Porter (q.v.), was ordered to effect the capture of New Orleans. On April 18, 1862, the mortar flotilla opened fire on Forts Jackson and St. Philip, which, facing each other across the Mississippi, guarded the approach to the city; but the bombardment made comparatively little impression, and on the 24th Farragut ran by the forts under a terrific fire (his flagship the *Hartford* suffering considerable damage), avoided the fire rafts sent against him, and with the loss of a single vessel (though three had been forced to put back), completely destroyed a Confederate fleet of 13 gunboats and two ironclads. (See Fort Jackson and New Orleans.) On April 27 he took formal command of New Orleans, which was almost immediately occupied by Federal troops under Gen. B. F. Butler (q.v.). On June 28, 1862, a part of his fleet passed the batteries of Vicksburg with slight loss and a few weeks later repassed them. On March 14, 1863, Farragut succeeded in running by Port Hudson with the *Hartford* and one other vessel, and, controlling the river between Port Hudson and Vicksburg, rendered essential aid to the land forces in the campaigns against those strongholds. In 1864 he was placed in command of a fleet of 25 vessels and ordered against Forts Morgan and Gaines at the entrance of Mobile Bay. These he attacked at daylight on August 5. Advancing in the face of the enemy's torpedoes, one of which sank the *Tecumseh*, he silenced the forts with a fierce bombardment, passed into the harbor, and there destroyed a Confederate fleet consisting of an ironclad ram and four gunboats. (See Mobile Bay.) He was raised to the rank of rear admiral in July, 1862, and when forced by ill health to withdraw from service, to that of vice admiral in December, 1864, and to that of admiral in July, 1866, the latter two grades having been expressly created for him by Congress. He made a long cruise in European waters in 1867 and subsequently visited California. Early in 1870 he went to Portsmouth, N. H., where he died. The authorized biography is that by Loyall Farragut, his son (New York, 1879); and Captain A. T. Mahan has written an excellent life from the standpoint of a naval expert in the *Great Commanders Series* (New York, 1892). Consult a biography by Barnes (Boston, 1899), and Spears, *David G. Farragut* (Philadelphia, 1905).

FAR′RAND, Livingston (1867–). An American anthropologist and psychologist, born at Newark, N. J. He graduated from Princeton University in 1888 and from the College of Physicians and Surgeons (Columbia) in 1891 and later studied at the universities of Cambridge and Berlin. In 1893 he was appointed instructor in psychology at Columbia University, in 1901 adjunct professor of that subject, and in 1903 professor of anthropology. He was secretary of the American Psychological Association from 1895 to 1904 and president of the American Folk-Lore Society in 1903. His writings treat principally of the anthropology of American Indians.

FARRAND, Max (1869–). An American university professor and writer on historical subjects, born at Newark, N. J., brother of Livingston Farrand. He graduated from Princeton (A.B., 1892; Ph.D., 1896). Between 1896 and 1901 he was instructor, associate professor, and professor of history at Wesleyan University and between 1901 and 1908 professor at Leland Stanford Junior University. He spent one year (1905–06) as acting professor at Cornell, and in 1908 he became professor of history at Yale. Besides contributions to historical periodicals, his publications include: *Legislation of Congress for the Government of the Organized Territories of the United States, 1789–1895* (1896); *Translation of Jellinek's Declaration of the Rights of Man and of Citizens* (1901); *Records of Federal Convention of 1787* (3 vols., 1911); *The Framing of the Constitution of the United States* (1913).

FARRAR, Edgar Howard (1849–1922). An American lawyer, born in Concordia Parish, La. He was educated at the universities of Virginia (A.M., 1871) and Louisiana, was admitted to the bar in 1872, and served as assistant corporation counsel and corporation counsel (1878–80). As a reformer, he actively promoted better municipal government for New Orleans, aided in the prosecution of the Mafia assassins, and had charge of the campaign which resulted in the defeat of the proposed extension of the charter of the Louisiana Lottery. He also took an active part in national Democratic politics. In 1882 he became one of the trustees of the funds used to found Tulane University. In 1906–08 he was president of the Louisiana Tax Commission and in 1910–11 president of the American Bar Association.

FAR'RAR, Eliza Ware (Rotch) (1791–1870). An American author. She was born in Flanders, while her parents were traveling in Europe, and was educated in England, where she lived until 1819. She became well known as the author of *The Children's Robinson Crusoe, The Story of Lafayette,* and *The Life of Howard. The Young Lady's Friend* (1837) also was exceedingly popular. Her later years were spent in Springfield, Mass. She married Prof. John Farrar of Harvard College.

FARRAR, Frederic William (1831–1903). A distinguished English clergyman, born at Bombay, India. He studied at the University of London and at Trinity College, Cambridge, was ordained deacon in 1854 and priest in 1857. For 15 years from 1855 he was an assistant master at Harrow and from 1871 to 1876 was head master of Marlborough College. In 1876 he was appointed a canon of Westminster Abbey and rector of St. Margaret's. He became Archdeacon of Westminster in 1883, chaplain of the House of Commons in 1890, and dean of Canterbury in 1895. He was Hulsean lecturer at Cambridge in 1870, Bampton lecturer at Oxford in 1885, and in the latter year visited the United States. A popular figure among the English clergy, he was prominently connected with numerous philanthropic enterprises. His literary work, extensive and varied, includes volumes of fiction, philological and theological studies, commentaries, biography, history, and didactic treatises, many of which gained a wide circulation. From a long list of titles may be cited: *Eric* (1858); *A Lecture on Public School Education* (1867); *Essays on a Liberal Education* (2d ed., (1868); *Seekers after God* (1869); *The Witness of History to Christ* (1871), the Hulsean Lectures for 1870; a much-read *Life of Christ* (2 vols., 1874; 12th ed. in the same year); a *Life of St. Paul* (1879); *The Early Days of Christianity* (2 vols., 1882); *Eternal Hope* (1878; new ed., 1914), in refutation of the extreme doctrine of eternal punishment; *Darkness and Dawn*, a story of Nero's time; *The Bible: its Meaning and Supremacy* (1897), an investigation of the subject of inspiration; *The Life of Lives* (1899). Consult Farrar, *Life of F. W. Farrar* (New York, 1904).

FARRAR, fär'är, Geraldine (1882–). An American dramatic soprano, born in Melrose, Mass. She began her musical studies with Mrs. J. H. Long in Boston, from whom she went to Madame Thursby in New York. After further study with Trabadello in Paris and Lilli Lehmann in Berlin, she made her début with almost sensational success as Marguerite in Gounod's *Faust* in Berlin at the Royal Opera, Oct. 15, 1901. A three-year contract was immediately offered her, and soon she was one of the prime favorites of the Berlin public. In 1906 she appeared as one of the leading sopranos of the Metropolitan Opera House of New York, and has since then been a regular member of the company. In several of the novelties she created the leading rôle. Her voice is a powerful soprano of rare beauty, although not quite flawless in coloratura passages. But for this one shortcoming she atones by her remarkable histrionic talent and subtle facial expression.

FARRE, fär, Jean Joseph Frédéric Albert (1816–87). A French general, born at Valence (Drôme). He commanded the pioneer corps in the army of occupation at Rome in 1859. Upon the outbreak of the Franco-German War he was director of the fortifications of Arras and after the downfall of the Empire organized the force in the northern department, which subsequently formed the divisions commanded by General Bourbaki. Farre succeeded to the chief command of the three divisions of the Army of the North on Nov. 19, 1870. Compelled to abandon his defensive position before Amiens by General Manteuffel (November 27), he was succeeded by General Faidherbe. In 1875 he was appointed general of division, and in 1879 became Minister of War, in which office he removed all prominent officers suspected of favoring the Legitimist or the Bonapartist cause; but his appointments, as well as preparations for the war against Tunis, proved so unsatisfactory that he was superseded (Nov. 14, 1881). In 1880 he was elected senator for life.

FAR'RELL, James A. (1863–). An American corporation official, born at New Haven, Conn. Although he began life as an unskilled workman for the New Haven Wire Mills in 1878, his promotion was rapid, and soon he became a mechanic and in 1882 a wire drawer with the Oliver Iron Company, Pittsburgh, Pa. After serving this latter corporation in the further capacities of foreman and salesman, he became sales manager in 1889 and later general manager for the Pittsburgh Wire Company.

When this firm was absorbed by the American Steel and Wire Company of New Jersey in 1899, he was retained as foreign sales agent of the new concern. In 1901 he took charge of the export sales department of the United States Steel Corporation, in 1903 he became president of the United States Steel Products Company, and in 1911 he was chosen to the presidency of the Steel Trust itself. He was one of the chief witnesses in the suit of the United States against that corporation in 1913.

FAR'REN, Elizabeth (c.1759–1829). A noted English actress, who became in 1797 Countess of Derby. She was the daughter of an itinerant actor named George Farren and appeared upon the stage when a child. She first appeared in London at the Haymarket in 1777, taking the part of Miss Hardcastle in *She Stoops to Conquer*. In the fall of 1778 she appeared at Drury Lane, where she became established at first in tragedy and, after the departure of Mrs. Abingdon in 1782, as leading lady in comedy. She is best known for her impersonations of fine ladies in the comedy of high life. Among her favorite parts were Clarinda in *The Suspicious Husband*, Lady Betty Modish in *The Careless Husband*, Lady Emily Gayville in *The Heiress*, Julia in *The Rivals*, and Lady Teazle in *The School for Scandal*. In this last rôle she made her final appearance April 8, 1797. She had previously been received in aristocratic society, and on May 1 of that year she was married to the Earl of Derby, who had long been devoted to her. She died at Knowsley Park, Lancashire. Boaden's remark upon her career is well known, that after her retirement comedy degenerated into farce. There is a somewhat coarse work called *Memoirs of the Present Countess of Derby, Late Miss Farren*, by "Petronius Arbiter" (London, 1797), to which two crude responses were published by more friendly pens. Her portrait, one of the earliest and best examples of the work of Sir Thomas Lawrence, is in the Metropolitan Museum, New York. Consult: Geneste, *History of the Stage* (Bath, 1832); Doran, *Annals of the Stage*, ed. by Lowe (London, 1888); Galt, *Lives of the Players* (ib., 1831); Lowe, in *Actors and Actresses of Great Britain and the United States*, ed. by Matthews and Hutton (New York, 1886).

FARREN, William (1786–1861). An English actor, famous especially for his acting of old men's parts in high comedy. He was the son of a prosperous actor of the same name, who lived in London, but he made his début at Plymouth, under his brother's management. For some time thereafter he lived in Dublin, till in 1818 he came to London and made his appearance at the Covent Garden Theatre, as Sir Peter Teazle. His Lord Ogleby, Sir Anthony Absolute, and Sir Andrew Aguecheek followed soon after. Having left Covent Garden in 1828, he appeared for a number of years at Drury Lane, where, in addition to some of his earlier favorites, he added the parts of Polonius, Sir Francis Gripe in *The Busybody*, Kent in *King Lear*, and numerous others. About 1840 he became one of the managers of the Haymarket, where he had occasionally played before, and there in 1843 he produced his Old Parr, an extraordinary depiction of old age. From 1850 to 1853 he was lessee of the Olympic Theatre. His farewell appearance was at the Haymarket in 1855. He was of distinguished appearance and unusual power of facial expression; some critics noted in him a lack of personal sympathy, which showed itself as well in private life. Though in his later years upon the stage he was in feeble health, his success in his familiar characters seems to have been but increased. His Grandfather Whitehead was one of the parts for which his own advance in age as well as the practice of his art contributed to fit him. His sons, Henry (c.1826–60) and William, often referred to as Young Farren, both became well-known actors. Consult: Lewes, *On Actors and the Art of Acting* (New York, 1878); Cook, *Hours with the Players* (London, 1881); Marston, *Our Recent Actors* (ib., 1890).

FAR'RER, Edward (1850–1916). A Canadian critic and journalist. He was born in County Mayo, Ireland, was educated at the Jesuit College, Stoneyhurst, England, and later at the Jesuit College, Rome. He began to study for the priesthood, but removed to Canada in 1870 and entered journalism as an editorial writer on the Toronto *Daily Telegraph*, later joining the editorial staff of the Toronto *Mail*, the organ of the Conservative party. In succession after 1874 he was an immigration agent in Ireland, foreign editor of the New York *World*, editor in chief of the Toronto *Mail* (1882–84), editor of the Winnipeg *Times* and the *Sun*, and a member of the editorial staff of the Toronto *Globe*, from which he retired in 1892. Later he lived for a time in Washington D. C., and then went to Ottawa, Canada, in 1905, where he became correspondent for various foreign periodicals and also a magazine writer. According to expert opinion no abler editorial writer than Farrer ever appeared in the Canadian press. His articles in 1882–84 in the *Mail* and later in the *Globe* excited the strongest opposing political and religious prejudices. He assailed the Jesuits and the Catholic hierarchy with great ability and, according to some critics, with a maladroitness in which his early training gave him special advantages; while in his later efforts he aroused Loyalist anger by his support of annexation to the United States.

FARRER, Henry (1844–1903). An American landscape painter and etcher. He was born in London, the grandson of Thomas Farrer the miniature painter, and was self-taught. He came to America in 1861 and first devoted himself to marine and landscape painting in water color. But he is better known by his etchings. The best of these are views about New York harbor, in which his treatment of sky is very successful. His brother Thomas Charles (c.1838–), an English architectural and landscape painter, was born in London and studied in Ruskin's free school. He spent some time in the United States, where he was prominent as a teacher and was one of the first members of the American Water Color Society. Afterward he returned permanently to London.

FARRER, Thomas Henry Farrer, first Baron (1819–99). A British economist, born in London and educated at Eton and at Balliol College, Oxford (B.A., 1840). Admitted to the bar in 1844, in 1848 he entered the employment of the Board of Trade, of whose marine department he was assistant secretary in 1850–65 and secretary in 1865–86. He exerted considerable influence on the commercial legislation of his time, particularly in favor of free trade and gold-standard currency. After retiring from office in 1886 he devoted himself to the advocacy of his economic theories. From 1889 to 1898 he was a member of the London County

Council, and in 1899 he was president of the Cobden Club. He was made Baronet in 1883 and a peer in 1893. His writings include: *Free Trade Versus Fair Trade* (1882; 4th ed., 1904); *The State in its Relation to Trade* (1883; 2d ed., 1902); *Studies in Currency* (1898); *What is a Bounty?* (1899).

FAR'RIER (obsolete *ferrier*, from OF. *ferrier*, from Lat. *ferrarius*, blacksmith, from *ferrum*, iron). One whose occupation is that of shoeing horses. In former times he often acted as veterinary surgeon as well as blacksmith. His vocation is one of the "common callings" and subjects him to the common-law obligation of practicing his art on demand and of discharging it with ordinary skill. For a breach of this obligation he is liable to an action for damages. He has at the common law a lien on the animal shod or treated for the labor done or expenses incurred in the course of his employment.

FAR'RINGTON, Oliver Cummings (1864–). An American geologist. He was born at Brewer, Me., and was educated at the University of Maine (B.S., 1881; M.S., 1888) and at Yale University (Ph.D., 1891), where he was tutor in 1890–91. Between 1882 and 1887 he taught science in various Maine academies, in 1893 he was an assistant in the United States National Museum, in 1894 he became curator of geology in the Field Museum of Natural History, Chicago, and from 1894 to 1904 he was lecturer on mineralogy at the University of Chicago. He was a collaborator in mines and mineralogy at the Paris Exposition in 1900 and a member of the International Jury of awards at St. Louis in 1904. Besides his magazine articles, he is author of *Observations of Popocatepetl and Ixtaccihuatl* (1897); *Meteorite Studies* (1902); *Gems and Gems Minerals* (1903); *Analyses of Iron Meteorites* (1907); *Analyses of Stone Meteorites* (1911).

FARS, färs, or **FARSISTAN**, fär'sē-stän' (Pers., Land of the Persians, anciently *Persis*). A province of Persia, situated along the north and east shores of the Persian Gulf (Map: Persia, E 8). The surface rises gradually from the coast to an elevation of from 2000 to 3000 feet. The valleys of this interior plateau land are well watered and exceedingly fertile. In the northwest are the mountains, the highest reaching 14,000 feet; in a basin to the east lies the large salt lake Bakhtegan. The chief rivers are the Shapur, Tab, Sefid Rud, Mand, and Bendemir. The climate is not unhealthful, except along the coast, where it is very hot in the summer. The province produces wheat, barley, rice, millet, tobacco, wine, dates, opium, linen, cotton, silk, cochineal, and roses for the manufacture of attar. The principal towns are Shiraz, the capital, and Abushehr, the principal port. About 30 miles north of Shiraz lie the ruins of the ancient city of Persepolis. The natives are dolichocephalic and represent one of the best-preserved types of the Aryan of the Iranian plateau, being fairer-skinned and more finely formed than the population generally. Pop. (est.), 750,000. See Persia, *Ethnology*.

FARSAN (fär-sän') **ISLANDS**. A group of islands in the southeastern part of the Red Sea, about 35 miles off the west coast of Yemen, in lat. 16° 30′ to 17° N. and long. 41° 45′ to 42° 10′ E. They comprise the two larger islands of Farsan Seghir, 18 miles long, and Farsan-el-Kebir, 25 miles long, with a number of islets and reefs. They are centres of important pearl and coral fisheries, also raise and export dates. On one of the islands, Kounch, there is a coaling station belonging to Germany. Chief port, Chor Farsan.

FARSISTAN. See Fars.

FARTHER INDIA, or Indo-China. The southeast peninsula of Asia. It embraces Tonkin, Annam, Laos, Cambodia, Cochin-China, Siam, Burma, Federated (and other) Malay States, and Straits Settlements proper.

FARUKHABAD, für'rŭk-hȧ-bäd', or **FURRUCKABAD**. A city in a district of the same name, United Provinces, British India, near the right bank of the Ganges, 87 miles northwest of Cawnpore by rail (Map: India, C 3). It is well built in a fine place, 570 feet above sea level. Potatoes, tobacco, and mangoes form its chief trade. Its manufactures include gold lace, brass and copper vessels, and calico prints. With Fatehgarh, the capital of the district, it forms a single municipality. Pop., 1901, 67,338; 1911, 59,647.

FASANO, fȧ-sä'nō. A city of Bari, south Italy, near the Adriatic, 45 miles northwest of Brindisi (Map: Italy, F 4). The city hall is a former palace, with a handsome loggia (1509), of the Knights of St. John. Two miles north of Fasano, which markets wine and oil, are the ruins of Egnatia, in Roman days a prosperous port, on the Appian Way. The ancient walls have been nearly all used by the peasants to build cottages of the modern Anazzo, and the wealth of vases, jewelry, and coins has gone to stock museums elsewhere. Pop. (commune), 1901, 16,848; 1911, 20,077.

FASCES, făs'ēz (Lat., bundles). Bundles of rods, usually made of birch, but sometimes of elm, with an axe projecting from the middle of them, which were carried before the chief magistrates of ancient Rome as symbols of their power over life and limb. They were borne by the lictors (q.v.), at first before the kings; in the time of the Republic, before consuls and prætors; and afterward before the emperors. Their number varied; a consul had twelve and a prætor six (within the city only two). Valerius Publicola introduced a law that within the city the axe be withdrawn, except in the case of a dictator, who was preceded by 24 lictors, bearing as many fasces. The axe was withdrawn within the city limits, because there the magistrates' power to inflict the death penalty was in time nullified, since in matters of life and death an appeal to the people was always possible. Publicola also required that the fasces be lowered at the assemblies of the people as an acknowledgment of their supreme power. A general who, after a victory, had been saluted as *Imperator* (see Emperor), had his fasces wreathed with laurel; later this honor was accorded only to the emperors.

FASCH, fäsh, Karl Friedrich Christian (1736–1800). A German musician, the founder of the Berliner Singakademie. He was born at Zerbst, where his father was court kapellmeister. He early developed considerable musical ability, and in 1756 became cembalist to Frederick the Great at Berlin. From 1774 to 1776 he was kapellmeister of the opera in Berlin, but after that he retired and devoted himself to composition. His church music was published in six volumes (1839), and a biography of Fasch was written (1801) by his successor Zelter. For the history of the Singakademie, see Choral Societies.

FASCIA, făsh'ĭ-ȧ (Lat., fillet). 1. In architecture, a flat space or band, like a broad ribbon, wider than a fillet (q.v.). This name is given to the edge or face of the corona of a classic cornice or of a belt course, and sometimes to the divisions of banded architraves, such as those of the Ionic, Corinthian, and Composite entablatures. 2. In anatomy, dense connective tissue occurring in sheets which envelop muscles or groups of muscles. It has lately been found to be the site of tuberculosis near tubercular glands.

FASCIA'TION (Neo-Lat. *fasciatio*, from Lat. *fascia*, fillet). A deformity of plants, common in shoots, which become several times as broad as usual, fluted, and often curved edgewise in crozier fashion. Fasciation is especially likely to occur in rapidly growing stems which are abundantly supplied with both water and food. See MALFORMATION.

FASCINA'TION (Lat. *fascinatio*, from *fascinare*, to charm, from *fascinus*, witchcraft) BY SERPENTS. A power has long been popularly ascribed to some kinds of serpents of fascinating by their eyes the small animals on which they prey so as to prevent the escape of the intended victim, and to cause it rather to run or flutter into the mouth which is open to devour it.

As an explanation of this conduct mesmeric or hypnotic influence has been suggested, but the whole matter is now regarded as exaggerated and to a great degree fabulous. Probably when any such action occurs it should be ascribed to fear so intense that the animal becomes stupid, or loses its powers of coördination, and is "paralyzed by fright." Animals respond in just these same ways when much frightened by other causes than serpents. Thus horses and other animals when actually rescued from floods or fire have been known to rush back again to their doom, or else they are too terrified to attempt escape.

FASCINES, făs-sēnz' (Fr., from Lat. *fascina*, bundle, from *fascis*, bundle). Fagots of brushwood or similar material, bound together, with wire if possible, and used in the construction of temporary field works, construction of levees, jetties, breakwaters, preparing foundation in marshes, and sometimes for setting fire to an obstruction. The standard military fascine employed in revetting field works is a cylindrical bundle of brush, closely bound. The usual length is 18 feet and the diameter 9 inches when compressed. Lengths of 9 and 6 feet, which are sometimes used, are conveniently obtained by sawing a standard fascine into two or three pieces. The weight of a facine of partially seasoned material will average 140 pounds. Straight pieces of brush, 1 or 2 inches at the butt, are used in the construction.

FASHER, fä'shẽr, EL. See EL FASHER.

FASH'ION (Fr. *façon*, from L. *factionem*, the make of anything). The style in dress of a brief period. The distinction between it and *costume* (q.v.) is based on scale and permanency. Fashion is ephemeral and comparatively trivial.

During the season of some one of the great popular fairs held in Munich, the men and women of the Dachauer Moos and of the country around the Starnbergersee, as well as people from the Bavarian mountains, which are a part of what we call the Tyrolese Alps, appear in the city with hats, coats, decorative suspenders for their breeches, short breeches, barred and striped stockings, and conical hats; the women wearing head coverings of indescribable kind not seen elsewhere in Europe, and an arrangement for their short black skirts, very difficult to describe, sometimes founded on a hooplike structure, not at the hips, as in the fashionable farthingales and panniers of the eighteenth century, but above them, just at the waist. Ugly as many of them are, they are ancestral, dating from old time, and in a sense unconscious—that is to say, the people of a given village have never known and do not dream of wearing garments of another style than these. This is *costume.* At the same time the ladies of Munich are wearing garments based upon the Parisian style of the same season or of the season immediately preceding, and the men of this same class of society are wearing partly English and partly French dress, the coats and trousers, hats and the rest being closely imitated from one or the other of these models. The style of these garments for both women and men varies from year to year and from season to season, not only in the shape of the garment and the fashion of its tailoring or dressmaking, but also in the material itself of which they are composed. It will be as rare at a certain time to see a black frock coat as it will be a few years later to see a blue one, and the changes in women's dress in the colors used, and even in the character and intensity of the colors, varies very greatly, usually changing slowly for a few seasons and then changing much more decidedly into a new style. This is *fashion.*

As transportation improves, commerce develops, and civilization advances, fashions tend to become world wide. The social leaders of New York and Buenos Aires, Cape Town and St. Petersburg, Berlin and even Tokyo, look to western Europe for their styles, women to Paris and men to London. But people of moderate means, not capable of indulging every fancy, follow at a slower pace, and therefore the dress of a French clerk will differ somewhat from that of an English clerk, and again from that of a man on a proportionately small salary in New York. Some few little peculiarities cling to the people of a nation or a city for a number of years, such as, for instance, the loose and long silk bow worn as a necktie, so common in the north of France, but rarely appearing in other countries except as worn by Frenchmen on their travels. These peculiarities, so far as they go, partake of the nature of costume. Some other peculiarities are merely attempts, as it were, of fashion which have failed to become universal. Thus, although American men usually wear hats of London form, there have been several epochs during the past 50 years when the London hats were very much higher in the crown and more aggressive than any of those worn in America. The changes in dress produced by the French Revolution were radical and permanent. Costumes distinctive of rank or occupation were largely abolished, and prince and peasant and pauper began to look alike. For over a century the costume of women has not deviated from waist and skirt in one or two pieces, with shawl, coat, or jacket as overgarment; and for men coat and waistcoat and trousers.

In the reign of Louis Philippe, following 1830, the frock coat was worn with skirts not very long, but cut so as to spread very widely, so that when the garment was worn buttoned it was extremely smart in appearance, fitting the body closely and having a very appropriate fullness where it covered the hips. At the same time the dress coat worn for occasions of some ceremony, and by elderly men who felt themselves of importance in the world, had very broad skirts and was capable of being buttoned across the breast. These were the fashions in France and to a great extent in England, though the cut of the frock coat was different there. These garments were of blue, claret, bright brown, and other decided colors, and the fashion lingered on in the United States to 1850 or thereabout, at which time a person continuing to wear the colored cloth of a former generation was remarked upon. As late as 1850 many gentlemen of middle age wore a blue dress coat buttoned up with large, flat, gilt buttons, a white waistcoat, and black, close-fitting trousers, the form which had replaced the far more graceful and dignified *pantalon;* for which see Costume.

The women of 1840 and thereabout wore a very reasonable and pleasant costume. The waist of the dress was so made as to be distinctly a bodice, separate from the skirt in make, if not of a different material; the skirt was very loose and full at the top and fell in ample folds or, if of thinner material, floated softly; altogether it was a very perfectly imagined and satisfactory gown. This was the immediate successor of the close-fitting garment of the Empire mentioned under Costume. These gowns in some of their many modifications lasted until the time of the crinoline (q.v.) or haircloth skirts, which were immediately succeeded by the hoopskirts or skirts made of metal springs, all these being used to expand and support the skirt of the gown, so that the dress of women from about 1850 until 1870 was, in a sense, grotesque. It was costly and bulky, unnatural in that it did not follow the lines of the body at all, and ugly because it swung in one stiff mass instead of falling in folds, and sometimes involved disagreeable exposures. No wonder that an American woman, Amelia Jenks Bloomer (1818–94), was inspired to start her campaign for rational dress, as a result of which trousers for women have since been known as bloomers. The rational dress as she wore it had a short skirt reaching just below the knees, with long, baggy pantalettes.

After the fall of crinoline and of the Second Empire, skirts continued to be wide, with the fullness supplied by abundance of material instead of by whalebone or steel, and with frills taking the place of flounces. Waists were short and ugly, and colors and material were combined with little taste. A charming innovation in 1872 were the Pompadour or Dolly Varden pretty flowered gowns in soft, thin materials for summer and evening wear. By 1878 the so-called princess dress was in full vogue, a purely modern development, with a long skirt that had to be carried in the left hand.

Another modern development is the tailor-made gown, due primarily to the women who go in for outdoor sports. But the fashion set by them was soon followed by women generally, until at one time "smart" and "tailor-made" were terms almost synonymous. The return to outdoor life on the part of the fashionable has also had its effect on the garments of men, and for the various sports special costumes have been developed.

Recently there has been a tendency in women's costumes towards the classic on the one hand and the mediæval on the other. The mania for dancing has eliminated unnecessary clothing, so that occasionally the follies of the Merveilleuses of a century ago seem about to be repeated. Art movements like cubism and futurism are also having a very distinct influence on fashions.

Bibliography. Hill, *History of English Dress* (London, 1893); Geszler, *Die Moden des XIX. Jahrhundert* (Vienna, 1897); Uzanne, *Les modes de Paris* (Paris, 1898); Boutet, *Modes féminines du XIXe Siècle* (ib., 1902); Price, *Dame Fashion, 1786–1912* (London, 1913).

FASHIONABLE LIFE, Tales of. A series of stories by Maria Edgeworth, of which three volumes appeared in 1809 and three in 1812.

FASHO'DA. See Kodok.

FAS'SETT, Cornelia Adèle (Strong) (1831–98). An American painter, born at Owasco, N. Y. She studied water-color painting in New York, oil painting in Paris and Rome under Mathieu and others, and in 1855 established in Chicago, Ill., a studio which she removed in 1875 to Washington, D. C. She was elected to the Chicago Academy of Design in 1873. Her works include portraits of President Garfield, Associate Justice S. J. Field of the Supreme Court, Clara Barton, and Gen. J. A. Logan, and the large canvas, "The Electoral Commission in Open Session" (1877–80), bought by the government for the Capitol.

FASSETT, Jacob Sloat (1853–1924). An American lawyer and Republican politician. He was born at Elmira, N. Y., graduated at the University of Rochester in 1875, and was admitted to the bar in 1878. In 1879–80 he was district attorney of Chemung County, and in 1880–81 studied constitutional law and political economy at Heidelberg University, Germany. From 1884 to 1892 he was a member of the New York State Senate, of which he was President from 1889 to 1891. He was secretary of the Republican National Committee from 1888 to 1892, and in 1891 was the unsuccessful Republican candidate for Governor of New York. He was temporary chairman at the Republican National Convention at Minneapolis in 1892. In 1905–11 he was a member of Congress.

FAST (AS. *fæsten*, Icel. *fasta*, Goth. *fastubni*, OHG. *fasta*, Ger. *Fasten*, fast, from AS. *fæsten*, Icel. *fasta*, Goth. *fastan*, OHG. *fastên*, Ger. *fasten*, to fast; probably connected with AS. *fæst*, Icel. *fastr*, OHG. *fasti*, *feste*, Ger. *fest*, fast, firm). A term used to express either total abstinence from meat and drink, or at least a certain restraint in respect of food. As a religious custom fasting seems to have originated in the conceived necessity of proper preparation for communion with the ancestral spirits in the sacrificial meal and in the ecstatic state. It was thus a sacrifice offered to the divinity, the acceptance of which was indicated by permission to partake in the sacrificial banquet and by the vision vouchsafed to the devotee. Hence its universal occurrence in some form in all religions and among common worshipers as well as among the religious leaders. It has been observed wherever ancestral worship has flourished, even though there was no marked tendency towards mysticism, and has not only maintained itself, but has developed especial intensity as a means of inducing an extraordinary psychical receptivity to spiritual impressions in monotheistic and pantheistic forms of religion otherwise preserving only slight traces of their animistic origin. The reduced vitality and increased nervous excitability occasioned by lack of proper nourishment have tended to produce a mental condition favorable to the seeing of visions and the hearing of voices, necessarily interpreted as objective realities. By curbing the appetites and the passions, they have served as means of moral discipline. On the other hand, the reaction has added joy and exhilaration to the following communion with the divinity. See FESTIVALS.

The custom prevailed among the Aztecs and Toltecs of Mexico, the Incas of Peru, and other American aborigines. It has been found among the Pacific Islanders, who occasionally use strong purges before venturing to eat holy meat. In China and Japan there are possible traces of it before contact with Buddhism, and it has been kept in eastern Asia wherever Brahmanism and Buddhism have spread. If the climatic conditions of India forced attention to dietary rules, the introspective attitude of her people naturally led to observation of the effects upon the mental activities of abstinence from food. Insensibility to pain, clairvoyance, attainment to a higher superconscious state, absorption in the divine seemed the rewards or results of a patient endurance. Already in the Yajur-Veda period this estimate of the value of fasting becomes apparent, and it is still widely prevalent in all parts of India. In the Mithras cult, a mixture of Mazdaic and orgiastic elements, it was a necessary preparation for initiation into the mysteries. As this faith spread over Armenia, Cappadocia, Pontus, and Syria the importance of the already existing religious custom was everywhere enhanced. It was indeed a characteristic requirement made by mystic cult societies in many lands. At least as early as the seventh century B.C. the Orphic societies in Greece demanded total abstinence from meat and beans, and subsequently the highest rites in the Eleusinian mysteries were preceded by a day of fasting. Similarly, fasting was required previous to initiation in the mysteries of Isis and Osiris, while in earlier times it does not seem to have been widely observed in Egypt, though it is known through Herodotus that at Busiris a fast preceded the sacrificial meal. The Romans also to some extent practiced fasting in connection with their festivals, and in later times before initiation in cult societies.

It is not certain that the Babylonians kept the custom, and the story of the fast in Nineveh (Jonah iii. 5 et seq.) merely shows that the late Jewish authors took for granted that the Assyrians fasted to avoid a great national calamity, though they may have been quite right in this assumption. In Israel fasting was, in earlier times, spontaneous and not regulated by law. The purpose appears to have been to arouse Yahwe's pity (2 Sam. xii. 22), to avert national calamity (1 Sam. vii. 6), to express sorrow for the dead (1 Sam. xxxi. 13), to prepare for a sacrificial meal (1 Sam. xi. 5), or to render a man fit for a special revelation (Ex. xxxiv. 28; Deut. ix. 9, 18). After the Exile, days of public fasting were instituted. They are first mentioned in Zech. viii. 19, where the fasts of the fourth, fifth, seventh, and tenth months are referred to and the question whether they should be observed is discussed. These fasts were ordained in commemoration of the misfortunes that had befallen Jerusalem, viz., the capture of the city on the 9th of Tammuz, the destruction of the temple on the 9th of Ab, the murder of Gedaliah on the 3d of Tishri (Jer. xli. 2), and the beginning of the siege on the 10th of Ab. The only day set apart for fasting in the Mosaic law is the 10th of the seventh month (Tishri). It is thought by modern scholars to have been instituted later than the four fast days previously mentioned. See ATONEMENT, DAY OF.

Still later is the observance of the 13th of Adar as a fast day. (See PURIM.) While the earlier prophets denounced the custom of fasting, the later prophetic writers seem to have regarded it as valuable. Prayer and fasting are often united, and the necessity of fasting as a preparation for divine revelations is emphasized (Dan. ix. 3; x. 2, 3, 12; 4 Ezra v. 13; vi. 31). The Pharisaic party practiced fasting on two days in the week, Monday and Thursday, though it is doubtful whether it ever was more than partial; the Essenes were led by their ascetic tendencies to attach much value to fasting; while the Sadducees, more conservative in such matters, did not go beyond the fast days prescribed in the law. As the Babylonian exile, rendering sacrifices impossible for a time, led to a development of fast days, so the misfortunes that in later times have befallen the Jewish people have occasioned the establishment of new fast days. These, however, have not become permanent. There are half days of fasting at the summer and winter solstices which may go back to earlier times; those before *Rosh hash-shana*, or the New Year's Day, and the Day of Atonement seem to be later developments. Fasting is often prescribed on certain memorial days. An Orthodox Jew fasts on his birthday after reaching the age of 13, and on the birthday of his first-born son till the latter reaches the age of 13, in commemoration of the sparing of the Israelite first-born in Egypt. The anniversary of the death of parents is also similarly observed. Fasting with the Jews always implies entire abstinence and lasts from daybreak till the appearance of the first three stars, except on the Day of Atonement and the 9th of Ab, when the period begins with sunset of the preceding day. Children, pregnant women, and the sick are exempted from the observance of fasting.

In the reported sayings of Jesus, He refers only twice to fasting. In Matt. vi. 16–18, He says: "When thou fastest, anoint thy head and wash thy face, that thou be not seen of men to fast," thus condemning all ostentatious fasting, and inferentially all public display of contrition. In Matt. ix. 14–17 and parallels, He answers the question why He and His disciples do not fast. All scholars are agreed that the strikingly original utterances concerning the new wine and the old bottles and the new piece and the old garment are genuine. Assuming the authenticity also of the remarks concerning the bridegroom who is to be taken away, Roman Catholic interpreters understand, not improperly, the words, "And then they shall fast in those days," to be a direct exhortation, and that the disciples were only exempted from fasting during the presence of their Master on earth. This must indeed have been the manner in which the words were apprehended in the early Church. But the genuineness of this saying is seriously questioned by competent critics, and it is most naturally understood as a justification of a practice not observed by Jesus Himself or His disciples in His lifetime, but subsequently adopted. It seems to be earlier than the story of His fast for 40 days (Matt. iv). These passages probably show that at the end of the first century fasting was quite generally observed in the Church. This is also shown by Acts xiii. 2, 3; xiv. 23; 2 Cor. vi. 5; xi. 27 and the interpolations found in the received text of Matt. xvii. 21; Mark ix. 29; Acts x. 30; 1 Cor. vii. 5. In the Oxyrrhyncus fragment containing what claim to be the sayings of Jesus, He is represented as having said, "If ye fast not in respect of the world, ye shall not find the Kingdom of God." The language is probably to be taken figuratively, may be directed against physical fasting, and certainly does not come from Jesus. Fasting was required as a preparation for holy acts and feasts, for ordination and baptism. The 40 hours between Friday afternoon and Sunday morning, commemorating the time when Christ lay in the sepulchre, were annually celebrated, and early fathers allude to the 40 days of Lent as handed down and observed by the Church. The moral earnestness of the Montanistic movement found expression in vigorous fasting. (See MONTANUS.) While Wednesdays and Fridays had no doubt been observed by fasting before his time, Montanus emphasized the necessity of abstaining from all food on these days, and probably was the first to lay down definite rules concerning fasting. The growing Catholic church was led by this movement to regulate more closely the matter of fasting and to grant certain relaxations. At the Council of Orleans (541) abstinence from meat during Lent, except on Sundays, was prescribed. The eighth Council of Toledo (633) declared those who ate meat during Lent sinners unworthy to partake in the resurrection. But the severe laws on this subject which prevailed in earlier times generally, and were made still stricter in the monastic rules (the Cistercians, for example, eating nothing at all until two o'clock in the afternoon), have been much relaxed in later days as a concession to the needs of modern complexity of life and severity of climate. To regulate the details of fasting has always been considered as within the authority of the Church; in George Herbert's phrase, "The Bible bids us fast—the Church says 'how.'" Accordingly the power of dispensation is considered by Roman Catholic theologians to reside primarily and universally in the Pope, for practical purposes also in the bishops, and (for individual cases) in parish priests and confessors. Fasting is divided into the natural or absolute and total fast, which means entire abstinence from any sort of food or drink, no matter in how small quantities; the ecclesiastical or partial fast; and abstinence. The first applies only to the regulation for those who are to receive Holy Communion; it lasts from the previous midnight until after communion, and is never relaxed except in the case of the dying. The second allows only one full meal in the day, with a small collation in the evening, and two ounces of dry bread with the morning coffee or tea. The third does not regulate the quantity, but forbids the use of meat. Normally, all week days in Lent, the ember days (q.v.) at the four seasons, certain vigils (q.v.), and in some countries the Wednesdays and Fridays in Advent are observed as strict fasts under the above definition; but the regulations vary considerably in detail in different countries. The bishops of the United States are allowed to relax very much the Lenten fast for the working classes. Those who are under 21 or over 60, the insane, sick, or convalescent persons, pregnant and nursing women, and those whose occupations are specially laborious or exhausting are excused from fasting. Strictly, the prohibition of flesh meat includes the products of the animals whose flesh is not to be eaten, as milk, butter, cheese, eggs, classed together as *lacticinia;* but in northern countries, at least, these are usually allowed, either by custom or express dispensation. The Roman Catholic church regards fasting as a means of grace, under two aspects—that of the actual mortification and that of obedience to ecclesiastical precept.

In the Greek church fasting is kept with much greater severity. The Easter fast lasts 48 days, that of Christmas 39 days, that in honor of the Virgin 14 days, and that of the Apostles begins on Monday after Trinity and extends to the 29th of June. There are also many vigils preparatory for great festivals. The Church of England considers fasting as praiseworthy, but not as obligatory, a useful exercise preparatory for the means of grace, but not itself one. The days named by the English church as seasons of fasting are the 40 days of Lent, including Ash Wednesday and Good Friday; the ember days, the three Rogation Days, all the Fridays of the year (except Christmas Day), and the eves or vigils of certain festivals.

Mohammed commanded but one fast, viz., that during the month of Ramadan (see RAMADAN), although he recommended fasting at certain other times as a meritorious act. The fast of Ramadan is rigorously observed, at least in letter, by all Moslems. Whether fasting was practiced in Arabia before contact with Judaism or Christianity is doubtful. Certain of the fasts recommended by Mohammed seem to be imitations; that on the 10th of Muharram (see MUHARRAM), for instance, corresponds to the Day of Atonement on the 10th of Tishri.

Abstinence from food may cause a grave condition of the body, and may even endanger life. In an experiment upon an animal which was caused to fast for 13 days, the more important tissues lost the following percentages of dry solid matter: the adipose tissues, 97 per cent.; the spleen, 63.1 per cent; the liver, 56.6 per cent; the muscles, 30.2 per cent; the blood, 17.6 per cent; the brain and spinal cord, none. The tissues in general became more watery than in health. As the amount of muscle lost during the fasting period contained about 15.2 grams of nitrogen, more than half the lost nitrogen came from metabolism of muscular tissue. Experience has taught that the weight of an adult's body may remain approximately constant for months or years, even under varying conditions of diet. Also, the relative proportions of the various tissues of the body remain constant, in addition to an unchanged weight. Evidently, in such cases, the expenditure of the body must precisely balance its income. If it did not lose as much nitrogen as it takes in, the body would gain in muscle. If it did not lose as much carbon as it takes in, it would put on fat. It may be losing or gaining carbon, losing or gaining fat, and yet the proteid constituents remain constant in amount, the expenditure of nitrogen being exactly equal to the income of nitrogen. This condition is called "nitrogenous equilibrium." In a fasting animal, while urea is excreted and carbonic acid is given off, the expenditure of nitrogen is very small. Glycogen and then fat disappear, and, lastly, some of the proteid. But, as the figures show, the heart and central nervous system are supported and lose but little in weight, while other organs are sacrificed to feed them.

The results obtained from the study of fasting men differ a little from those in the case of starving animals. In men the excretion of nitrogen diminishes continuously for several days. There is a diminution of the chlorine and urea in the urine, and an increase in phenol. The respiratory quotient sinks to a figure less than the one corresponding to oxidation of fats alone. The inference must be that some of the carbon of the disintegrated proteids is stored up in the body as glycogen.

After a certain period of fasting, fever, restlessness, and delirium generally set in. The delirium may be mild, with hallucinations of food and drink, or it may be furious. Age and obesity have a considerable influence upon the length of time life persists, in the face of actual starvation. A case is recorded, of the wreck of the frigate *Medusa* in 1876, when 15 people survived without food on an open raft for 13 days. In the case of a convict, quoted by Bérard, life was sustained on water alone for 63 days. Generally death occurs after eight days of deprivation of food. Many alleged cases of fasting for 30 days, or even some years, by certain professional fasters or religious women are mere impostures. Constantly watched by physicians, the Italian Succi actually fasted for 40 days in London, March and April, 1890. He took only water, emetics, cathartics, and an opium "elixir," and smoked tobacco. Dogs live from 30 to 35 days if deprived entirely of food and drink.

Hibernating animals (see Hibernation) are capable of sustaining the want of food for an apparently indefinite period of weeks during the winter sleep; but no warm-blooded animal can endure fasting in anything like the same degree as the reptiles—in many of which, indeed, the natural state of existence is one of long intervals between the times of taking food, and in which the vital change of texture is remarkably slow. Thus the remarkable amphibious animal, the *Proteus anguinus*, has been known to live for years without food, and the same is true of salamanders, tortoises, and even goldfishes. In attempting the recovery of persons reduced by fasting, food must be given in very small quantities at a time, and of the most nourishing and digestible quality; stimulants should be either withheld or very cautiously administered. The most important point, sometimes even before food is given at all, is the removal of the chill of the body by gradually applied heat; for, in addition to emaciation and arrest of secretion, the animal heat falls perceptibly during fasting.

Bibliography. Consult the Hebrew archæologies of Nowack (Freiburg, 1894) and Benzinger (2d ed., Tübingen, 1907); Linsenmayr, *Die Entwicklung der kirchlichen Fastendisziplin bis zum Konzil von Nicäa* (Munich, 1877); Robertson Smith, *Religion of the Semites* (Cambridge, 1894); Smend, *Alttestamentliche Religionsgeschichte* (Freiburg, 1899); Duchesne, *Origines du culte chrétien* (4th ed., Paris, 1909); Dowden, *The Church Year and Kalendar* (Cambridge, 1910); Westermarck, "The Principles of Fasting," in *Folk-Lore* (London, 1907); MacCulloch, "Fasting," in Hastings, *Encyclopædia of Religion and Ethics*, vol. vi (New York, 1912). For the physiological effects, consult: Flint, *Text-Book of Human Physiology* (New York, 1879); Account of Succi, *British Medical Journal*, i, 1444 (1890); Brewster, *Saints and Festivals of the Christian Church* (New York, 1904). See Calendar, Festivals.

FAST AND LOOSE. A phrase signifying recklessness of behavior, as to play fast and loose with another's interests. It is also the name of a cheating game, called *pricking at the belt*, which appears to have been much practiced by the gypsies in the time of Shakespeare. The following is a description: "A leathern belt is made up into a number of intricate folds and placed edgewise upon a table. One of the folds is made to resemble the middle of a girdle, so that whoever shall thrust a skewer into it would think he held it fast to the table; whereas, when he has so done, the person with whom he plays may take hold of both ends and draw it away."

FASTENRATH, fäs′ten-rät, Johann (1839–1908). A German author, born at Remscheid. He studied at the universities of Bonn, Heidelberg, Munich, and Berlin, and in Paris; traveled extensively in Spain in 1864, 1869, and 1879; published several volumes of free renderings of both older and more modern Spanish authors (*Ein spanischer Romanzenstrauss*, 1866; *Hesperische Blüten*, 1869; *Immortellen aus Toledo*, 1869); and in *Das Buch meiner spanischen Freunde* (1870) introduced to German readers the work of contemporary Spanish poets through translations of representative specimens. His *La Walhalla y las glorias de Alemania* (1872–87) performed a reverse service, describing for Spanish benefit, under the guise of interesting essays, prominent German characters from the days of Hermann. Numerous other original volumes and translations have in a scholarly manner familiarized in Germany much of Spanish literature and history.

FAS′TI (Lat. adj., in nom. pl. masc., legal, lawful, from *fas*, divine law, sc. *dies*, days). Among the Romans, the days on which it was lawful to transact legal business before the prætor; while the *dies nefasti* were those on which courts were not in session. The *dies comitiales*, on which the assembly and the Senate might convene, were also loosely styled *fasti*. The *nefasti* embraced the *dies religiosi* and the *feriæ* (holidays). Of the strict *dies fasti* there were some 40; of the *dies comitiales*, some 190; of the *dies nefasti*, about 50; of the *dies religiosi*, some 50. There were also eight *dies intercisi*, which for certain hours in the forenoon and afternoon were *nefasti*, and *fasti* for the remaining hours; and there were three *dies fissi*, which were, like the *intercisi*, partly *fasti* and partly *nefasti*. The sacred books, in which the lawful days of the year were marked, were themselves denominated *fasti*, and the term was employed, in an extended sense, to signify various kinds of registers, which have been often confounded with one another. These registers fall into two principal divisions—the *Fasti Sacri* or *Kalendares*, and the *Fasti Annales* or *Historici*.

1. *Fasti Kalendares*, or calendars of the year, were kept exclusively by the priests for about four centuries and a half after the building of the city. The appearance of the new moon was proclaimed by a pontifex, who then announced to the people the time which would intervene between the kalends and the nones. (See Kalends; Calendar.) On the nones the country people assembled for the purpose of learning from the *Rex Sacrorum* the various festivals of the month and the days on which they would fall. In the same way those who intended to go to law learned on what days it would be

right (*fas*) to do so. The mystery with which this lore was surrounded, for purposes of power and profit, by the favored class was dispelled by Cn. Flavius, the scribe of Appius Claudius Cæcus, who surreptitiously copied from the pontifical book the requisite information, and published it to the people in the Forum (304 B.C.). Henceforth time-tables (*fasti*) became common, very much resembling modern almanacs. They contained the days and the months of the year, the nones, the ides, lawful and unlawful days, etc.; astronomical observations on the rising and setting of the fixed stars, the commencement of the seasons, brief notices concerning the introduction and signification of certain rites, the dedication of temples, the dates of victories, disasters, and the like. Each day was marked by a letter which showed its character; thus: N (= *nefastus*), F (= *fastus*), C (= *comitialis*). In later times the exploits and honors of the Imperial family were duly entered in the calendar. The celebrated *Fasti* of Ovid is a sort of poetical companion to the calendar for the first six months of the year, as published by Julius Cæsar, who remodeled the Roman year. Written in elegiac metre, Ovid's *Fasti* relate the origin of the festivals as told in the legends, and are important to the student of antiquities.

Several very curious specimens of *fasti* on stone and marble have been discovered, of which one of the most remarkable is the *Kalendarium Prænestinum*, the work of the learned Verrius Flaccus, which stood in the lower part of the forum of Præneste, described by Suetonius. This covers January, March, April, December, and part of February. Very interesting also are two farmers' almanacs (*menologia rustica*), now in the Museum of Naples. They are cut on four sides of a cube; each of these sides is divided into three columns, each column embracing a month. The various agricultural operations to be performed in each month are given on these curious relics, in addition to the ordinary information contained in such calendars.

2. *Fasti Annales* or *Historici* were chronicles containing the names of the consuls and other magistrates of the year, and an enumeration of the most remarkable events in the history of Rome, noted down opposite the days on which they occurred. From its application to these chronicles the word *fasti* came to be used by the poets as synonymous with historical records. A very interesting specimen of *fasti* of this class was discovered in the Forum at Rome in 1547. It is a series of inscriptions on the marble walls of the Regia, dating from 36 B.C., and containing a fairly complete register of the consuls; hence it is known as *Fasti Consulares*. The broken fragments were collected and arranged by Cardinal Allessandro Farnese and placed in the capitol, where they may still be seen, with some additional portions discovered in 1817 and 1818; for this reason they are known also as *Fasti Capitolini*. *Fasti Triumphales* gave lists of those who had been honored with a triumph; *Fasti Sacerdotales* gave lists of the priests. The fragments of the *fasti* are published in the *Corpus Inscriptionum Latinarum*, vol. vi, pt. i (Berlin, 1876). Consult: Soltau, *Römische Chronologie* (Berlin, 1889); Smith, *Dictionary of Greek and Roman Antiquities*, vol. i (3d ed., London, 1890); *Corpus Inscriptionum Latinarum*, vol. i (2d ed., Berlin, 1893 ff.); Marquardt, *Römische Staatsverwaltung* (2d ed., Leipzig, 1885); Schanz, *Geschichte der Römischen Litteratur*, vol. i, § 14 (3d ed., Munich, 1907); Wissowa, "Fasti," in Pauly-Wissowa's *Real-Encyclopädie der classischen Altertumswissenschaft*, vol. vi (Stuttgart, 1907); Costa, *I Fasti Consulari Romani* (Milan, 1910); Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912). For a drawing showing the Regia with the *fasti*, consult Platner, *The Topography and Monuments of Ancient Rome* (2d ed., New York, 1911).

FAST'NET LIGHTHOUSE. See CAPE CLEAR.

FAS'TOLF, SIR JOHN (c.1378–1459). An English soldier noted for his services in France during the last phase of the Hundred Years' War. He distinguished himself at Agincourt (q.v.) and still more at the "Battle of the Herrings," Feb. 12, 1429, so called because, while conveying supplies to the English besiegers of Orléans, he formed a sort of laager of herring barrels and with his archers beat off a much larger French army. On June 18 the united forces of Fastolf and Talbot were defeated at Patay by Joan of Arc. According to Monstrelet, Fastolf displayed such cowardice that the Duke of Norfolk degraded him from the Order of the Garter, an honor which he had received in 1426. This, however, is very questionable, for he seems to have retained all his honors till his return to England in 1440. In 1441 he was granted a pension of £200. His Norfolk life is mirrored faithfully in *The Paston Letters*, where he is pictured as occupied busily in adding to his broad possessions, heaping up riches, building a huge new castle at Caister—a hard old man, yet not without some love of learning and the Church. He died Nov. 5, 1459. Attempts have been made to identify him with Shakespeare's Falstaff. Consult *The Paston Letters*, ed. by Gairdner (London, 1872–75), and Duthie, *The Case of Sir John Fastolf* (ib., 1907).

FAT. See FATS.

FA'TAL CHILDREN. A name given in early times to those children, such as Œdipus, Perseus, etc., who were expected to bring evil to their parents. In mediæval days the term referred especially to children whose mothers died at their birth. Such an event was supposed to be an augury of the future fame but early death of the orphan. Volsung in the Teutonic myth and Tristram in the Arthurian romance were two children doomed to this fate.

FATAL CURIOSITY. The name given to a well-known story contained in Cervantes' *Don Quixote*, which narrates the temptation of a wife.

FATAL DISCOVERY, THE. A play by John Home, produced by Garrick, Feb. 23, 1769, at Drury Lane.

FÄTAL DOWRY, THE. A tragedy by Massinger, published in 1632, but probably written a number of years earlier. It was imitated by Rowe in his *Fair Penitent*.

FA'TALISM (from *fatal*, from Lat. *fatalis*, relating to fate, from *fatum*, fate, from *fari*, Gk. *φάναι*, *phanai*, to speak, Skt. *bhā*, to shine). The doctrine that the course of events is so determined that what an individual wills can have no effect upon that course. Fatalism should be carefully distinguished from *determinism* (q.v.), as the confusion of these two conceptions has been responsible for much of the popular prejudice existing against determinism. In fact, determinism and fatalism are fundamentally antagonistic. Determinism asserts that events are determined by some of the events that immediately precede them; that if the latter were different the former would be different. Fatalism denies that immediately preceding events have anything to do with the origination of certain events immediately following; it asserts that the latter would occur even if the former were changed. A fated event is one that does not take place according to natural law; a determined event takes place according to the natural law which determines it. Hence the futility of the attempt, e.g., to escape a fated death; for such an attempt consists always in the avoidance of the *causes* of death. But a death which would be a determined consequence of a fall from an aëroplane can be avoided by keeping to the ground. For the fatalist what actually determines the event is not another event immediately preceding, but some mysterious decree issued by some mysterious agent ages before the event. But determinism, which merely asserts that every event has its determining conditions in its immediate antecedents, may include among the determining antecedents the human will. Thus, determinism is consistent with a belief in the efficiency of will, and fatalism is not. Determinism tries to account for an act of will as well as for every other occurrence. It looks *back* from the will to its antecedent conditions. Fatalism, looking *forward* from the act of will, denies any effective consequence to it. Determinism puts the will as a link in a chain of events. Fatalism breaks the chain when human will appears. The determinist assumes that the will both counts and is to be accounted for. The fatalist declares that the will does not count.

Both fatalism and determinism, thus distinguished from each other, should likewise be distinguished from *predestinationism*. (See PREDESTINATION.) Calvinistic predestination is not fate, for it is carried out by the agency of natural law; or, as it is usually put, "in predestining the end God also predestined the means." Fatalism conceives of God or some other inscrutable power as decreeing the end, and then waiting till the appointed time to bring it about, whatever may be the conditions prevailing then; the means adopted are those which overbear any efforts the victim may make. The predestined victim is predestined not to thwart the use of the predestined means. Determinism, on the other hand, assumes no decree, whether of God or of fate. It is the natural development of situations and not a supernatural power that for determinism brings about the determined result. Predestination is determinism *plus* the belief in a supernatural power that established the determining natural order. Fatalism is a belief in a supernatural power that predetermines without recourse to natural order.

Fatalism has had wide currency in popular thought. It appeared among the Hebrews, the Greeks, the Romans, and is especially prevalent among Mohammedans. But in the modern Occident it has little foothold wherever science has had a controlling influence. It owed its origin to the fact that many events in man's life seem to be inevitable. This inevitableness of occurrence when there was ignorance as to the causes naturally led to a belief in an outside power that fixed events by decree.

FATAL MARRIAGE, THE; OR, THE INNOCENT ADULTERY. A tragedy by Southerne (1694), founded on Mrs. Behn's novel *The Nun*. The underplot, omitted in Garrick's revival (1757), was drawn from Fletcher's *Night Walker*.

FATA MORGANA, fä'tȧ môr-gä'nȧ (It., fairy Morgana, who is supposed to cause the mirage). A striking kind of mirage observed in the Strait of Messina and elsewhere in Italy. A spectator on the shore sees images of men, houses, ships, etc., sometimes in the water, sometimes in the air—the same object having frequently two images, one inverted. See MIRAGE.

FATA MORGANA. A fairy, the sister of Arthur and pupil of Merlin, called also "Morgaine la Fée" and "Morgue la Fay," represented in Boiardo's *Orlando Innamorato* as dispensing riches from her home at the bottom of a lake.

FATBIRD. See SANDPIPER; OILBIRD; GUACHARO.

FATEHGARH. A town in the United Provinces of India, headquarters of Farrukhabad District, 87 miles northwest of Lucknow. It contains a barracks garrisoned by British and native infantry. The trade is local, and tents are manufactured. It now forms a municipality with Farrukhabad. Pop., 1901, 16,278; 1911, 12,500. Fatehgarh was fortified in 1714 and passed into the hands of the British in 1802. During the mutiny in 1857 the entire foreign population was massacred by the rebels, who besieged the town for a week.

FATEHPUR, FATHIPUR, or **FUTTEHPUR,** fŭt'ĭ-pōōr'. The capital of the district of the same name, in the United Provinces, British India, on the great trunk road between Calcutta and Delhi, 70 miles northwest of Allahabad. (Map: India, D 3). Its chief product is whips. Besides the civil buildings of the district, it contains the small but elegant mosque of Nawab Bakar Ali Khan. Pop., 1901, 19,281; 1911, 16,939.

FATEHPUR-SIKRI, sĭk'rĭ. An ancient capital of the Mogul Empire, India, in the Agra District, United Provinces, 23 miles east of Agra. The city is celebrated for its well-preserved remains of magnificent architectural works, among which are a mosque, with the sarcophagus of Salim Chishti, with a canopy of mother-of-pearl, five palaces, and a city wall 5 miles in circuit. These date from 1569 and were part of the great city of Fatehpur, built by the Emperor Akbar and his son Jehangir; but after the death of the latter the city was abandoned and the seat of power transferred to Agra. The small modern town of Fatehpur and its suburb Sikri, near the ruins, have a population, 1901, 7147; 1911, 6132. Consult E. B. Howell, *A Handbook of Agra and Taj, Sikranda, Fatehpur Sikri, etc.* (1904).

FATES. See PARCÆ.

FATHEAD. The most common of the blunt-nosed minnows (*Pimephales promelas*), numerous all over the warmer parts of the United States. It is 2½ inches long, dusky, olivaceous, the head jet black (in the male), and a black bar across the dorsal fin: but it is highly variable.

FATHER-LASHER (apparently from *father* + *lasher;* for *father*, in this usage, compare perhaps *daddy longlegs*). A small fish (*Cottus bubalis*), the most common and spiny of the British sculpins (Cottidæ), armed with strong spines on the back of the large head and on the gill covers. It is brown above, whitish beneath, curiously marbled and spotted, the fins marbled black and white, and repulsive in appearance; its flesh is good. but little eaten in Great Britain. When touched it distends its gill covers, sets out its spines, and assumes a very threatening appearance.

FATHER, of Angling. Isaak Walton, author of *The Compleat Angler*.

Of Ecclesiastical History. The name given to Eusebius of Cæsarea.

Of English Cathedral Music. A name generally given to Thomas Tallis or Tallys (1515–85), organist of Waltham Abbey, gentleman of the chapel royal, and composer of *Service in the Dorian Mode*.

Of English Poetry. A title applied by Dryden to Chaucer.

Of English Prose. A title given to Roger Ascham.

Of Epic Poetry. A name given to Homer, as the author of the *Iliad* and the *Odyssey*.

Of French History. André Duchesne, one of the earliest French historians.

Of German Literature. A title applied to Lessing as the leader in reviving a national German literature.

Of Good Works. Sultan Muhammed II of Turkey.

Of Greek Music. Terpander of Lesbos.

Of Greek Tragedy. The title given to Æschylus.

Of History. The name given to Herodotus, as the first writer of real history.

Of Jests. See Miller, Joseph.

Of Letters. 1. A title bestowed on Francis I of France. 2. Lorenzo de' Medici.

Of Lies. Satan. The title has also been used of Herodotus, from disbelief in the stories he relates.

Of Medicine. A title given to Hippocrates.

Of Moral Philosophy. A surname of Thomas Aquinas.

Of Music. A name given to Palestrina.

Of Orthodoxy. A title applied to Athanasius, Bishop of Alexandria, for his zeal in combating the Arian heresy.

Of Peace. A title given to Andrea Doria by the Genoese.

Of Ridicule. A surname of François Rabelais.

Of the Faithful. A title given to Abraham, as the ancestor of the Jewish nation.

Of the Marshalsea. William Dorrit, in Dickens's *Little Dorrit*.

Of the People. A title assumed by the kings of Denmark and by Louis XII, Henry IV, and Louis XVIII of France.

Of Waters. A name given to the Mississippi River, on account of its great length and numerous tributaries.

FATHER PROUT. The nom de plume of Francis Mahony (q.v.).

FATHERS, The Apostolic. The six fathers of the Church who were contemporaries of the Apostles; Barnabas, Clement of Rome, Hermas, Ignatius, Papias, and Polycarp.

FATHERS AND SONS. A novel by Turgenev (q.v.), a presentation of theoretic nihilism.

FATHERS OF CHRISTIAN DOCTRINE. See Doctrine, Fathers of Christian.

FATHERS OF MARY. See Marists.

FATHERS OF MERCY. See Mercy, Fathers of.

FATHERS OF THE CHURCH. A title of honor applied to the early writers of the Christian Church. The name can be traced back to the fifth century, but its early significance is sometimes complicated by the habit of applying the title of father to bishops, especially when assembled in council. Its extent is subject to question, as some refuse to apply it to those who, like Origen and Tertullian, had fallen under suspicion of heresy. It is often, however, used of all the greater early Christian writers. When the Church, by the declaration of either a general council or a pope, has borne special testimony to the requisite qualities of orthodoxy, holiness, and eminent erudition, the formal title of "Doctors of the Church" (q.v.) is given to such writers. The limitation of the period within which the name is applied has never been very precise; most commonly it is taken to end with the death of St. John Damascene (c.754) for the Eastern church, and with that of St. Gregory the Great (604) for the Western. Consult the best general collection, Migne, *Patrologiæ Cursus Completus* (387 vols., Paris, 1844–66), with the continuation; Horoy, *Medii Ævi Bibliotheca Patristica, sive Patrologia ab Anno 1216 usque ad Concilium Tridentinum* (ib., 1879 et seq.); Bardenhewer, *Patrology: Lives and Works of the Fathers of the Church, translated by Shahan* (St. Louis, 1908); *Apostolic Fathers* (2 vols., New York, 1912); Lightfoot, *Apostolic Fathers* (2d ed., ib., 1912). The Vienna Academy is issuing (1866 et seq.) a *Corpus Scriptorum Ecclesiasticorum Latinorum*, of a critical character. Translations of many fathers may be found in the Ante-Nicene, Nicene, and Post-Nicene libraries (New York, 1885 et seq.).

FATHERS OF THE PIOUS SCHOOLS. See Piarists.

FATHER TOM AND THE POPE, or A Night at the Vatican. An amusing broad satire by Samuel Ferguson, which first appeared in *Blackwood's Magazine* for May, 1838. The hero is generally supposed to have represented the Rev. Thomas Maguire, rector of a parish in Leitrim, and was afterward introduced in Lever's *Harry Lorrequer* as Father Tom Loftus.

FATHER VIOLET. See Corporal Violet.

FATHIGARH, fŭt'ē-gär'. See Fatehgarh.

FATHIPUR. See Fatehpur.

FATH'OM (AS. *fæþm*, cubit, Ger. *Faden*, fathom, *faþa*, inclosure; ultimately connected with Gk. *πεταννύναι*, *petannunai*, to spread out). A measure of length equal to 6 feet. It was formerly ascertained by extending both arms and measuring to the finger tips, and this method is still used by sailors in measuring short lengths of rope. In the United States, England, and Russia the measure is applied to depth of water and length of rope.

FATHOM, Ferdinand, Count. See Ferdinand, Count Fathom.

FATIGUE, fȧ-tēg' (from Lat. *fatigare*, to fatigue; probably connected with *af-fatim*, enough). Fatigue usually follows long-sustained application, whether of mind or body. The distinction is often drawn between physical or bodily fatigue and mental fatigue. There is, however, a common element in the two. The mental experience which we call exhaustion or weariness is of one and the same kind, whether caused by prolonged muscular work or by sustained thinking. But it is customary to include in physical fatigue the altered condition of the muscles which renders them, for the time being, unfit for use. Thus we say that our arm or body is tired, or that we are "tired all over." Similarly there is sometimes included in mental fatigue the laxness of "mental endeavor" and the increased inattention which follow upon hard study or the contention of diverse motives. These concomitants should, however, be kept distinct from the real experience of fatigue.

There is some disagreement among psychologists in regard to the ultimate analysis of fatigue. It is argued, on the one hand, that fatigue is a complex of more or less intensive organic sensations (q.v.), usually toned with pleasantness or unpleasantness, and even passing over into pain where the limit of endurance is approximated; while, on the other hand, it is urged that fatigue is as simple and unanalyzable as is the sensation of red or the tone of a tuning fork. The truth seems to lie between the two views. As a rule, many processes coöperate in the production of fatigue; but the experience itself is a fusion (q.v.), so close that it is hardly possible by introspection to wrench the constituent elements out of their union.

The experimental study of fatigue and of its effects, mental and physical, began with the observation of the course of exhaustion in the muscle taken from the frog's leg. When the nerve supplying the muscle was stimulated at successive intervals by an electric current, it was found that the contractility of the muscle suffered a constant decrement every time that the current was passed, until, finally, no movement at all was produced. If, however, the muscle were now thoroughly bathed with a weak saline solution, contractility was restored. This circumstance has led to the conclusion that at least part of the effect of fatigue lies in the accumulation of toxic materials, which prevent the contraction of the muscle. These materials are usually carried off in the blood, as is shown by the fact that the injection of blood from a fatigued into a normal animal gives rise in the latter to all the symptoms of exhaustion.

Over and above the action of poisonous materials, muscular fatigue is conditioned upon the exhaustion of the energy which is supplied by the blood in the form of nutriment. If dissimilation is more rapid than assimilation, the fat and even the substance of the muscle itself are gradually consumed. If, however, the consumption of energy does not exceed the supply, and if the waste products are speedily renewed by the blood, fatigue of a muscle does not ensue. The heart, e.g., beats throughout the individual's lifetime without causing fatigue. Moreover, every muscle seems to have optimal conditions for work, which include an appropriate loading and a sufficient interval for rest between contractions. Whether the feeling of fatigue is aroused by the lack of nutriment in the muscle, or only by the poisonous waste products, is not definitely known. In any event, it is necessary to pass beyond the muscle and to inquire into the immediate nervous conditions of fatigue. It is clear that a muscle could not feel fatigue apart from a nervous system. The conducting nerve fibres do not appear to be exhausted by fatigue; for they will continue to function for hours after the muscles have refused to contract. But the case is different with the nerve cells of the brain. It has been found that these cells undergo serious alterations, both during artificial stimulation by electricity and during muscular exercise. Under exhaustion the cell body becomes shriveled and the nucleus takes on a changed appearance. It is fair to suppose that these differences are directly connected with the experience of fatigue.

If a muscle is so thoroughly exhausted that it refuses to respond to a voluntary effort at contraction, it may nevertheless continue to work if it is electrically stimulated. And, on the other hand, voluntary contraction ensues when electrical stimulation is inefficient. It is difficult, however, to draw conclusions from these cases; for in either event some new muscular element is apt to be brought into function by the new source of stimulation.

An objective measurement of the effect of muscular fatigue is afforded by the use of the ergograph, an instrument which records the amount of work that a muscle, or rather a restricted group of muscles, performs in lifting a known weight or in pulling against a coiled spring. Other instruments which are occasionally used are the dynamometer, which tests muscular strength, and the sphygmograph and pneumograph (see PSYCHOLOGICAL APPARATUS), which record the rate and form of the heart beat and of the respiration respectively. A method frequently employed is known as the tapping test. The observers are asked to beat time on a telegraph key, following some assigned rhythm, at whatever rate best suits them. The variation from the normal of the number and rate of the movements are then taken to measure the amount of fatigue. While, however, these methods furnish measures of muscular fatigue, they are of little value in the measurement of mental fatigue, since no correlation of the two can at present be made out. Various methods, therefore, have been devised for measuring the general intellectual fatigue which follows upon mental exertion. School children in particular have been subjected to tests for the determination of the fatigue effects of various studies. Two types of method have been employed. 1. In methods of the first type tasks are set at various periods during the school day, and the degree of fatigue is measured by the amount of work done and the number of errors made. The tasks are simple and well within the ability of the pupil: writing from dictation, simple computation, memorizing, the completion of mutilated texts, the cancellation of specified letters or words in a printed text, or, finally, combinations of these tests. The results are of value as providing some indication of the degree of fatigue at various hours of the day; but the procedure does not enable us to measure the course of fatigue step by step. To overcome this difficulty the fatiguing work itself is used as a test, and the change in the quantity and quality of the work done is taken as an index of the fatigue. In all tests of this type material should be provided which offers the same degree of difficulty, and the pupil should give equal and uniform attention throughout—two requirements which are by no means easy of fulfillment. 2. Tests of the second type also are introduced between the periods of study at various points in the day's work, e.g., at the end of every hour. The first of these methods is that of æsthesiometry. Two blunt compass points are set down near together upon the skin and gradually separated until the individual is just able to distinguish the points as two. This just discriminable difference of locality is called the limen for localization. (See EXTENSION; PSYCHOPHYSICS.) It has been found slowly to increase under fatigue. The attempt has also been made to measure fatigue by the degree of variation in sensitivity to pain and by the ability of the observer to estimate time intervals. Both methods, however, have proved to be unsatisfactory; the former because no agreement has been reached as to whether fatigue increases or decreases sensitivity to pain, and the latter, because the estimation of intervals is too difficult for untrained observers, especially when working under nonexperimental conditions. Indeed, in all the methods of this type, there are numerous sources of error which must be recognized and controlled if valid results are to be secured.

In the course of experiments on fatigue a number of factors have been discovered which influence the work curve, i.e., the amount or the quality of the work. The most important of these factors are (1) *practice* (q.v.); (2) *habituation*—the novelty or unpleasantness of the work soon wears off: (3) *warming up*—there is a short period, the length depending upon the individual, which must be passed through before the quantity and quality of the work reach their maximum; (4) *swing*—after the warming-up period, a stage is reached where the work is at its best, when we feel "fit," or when we have "got into the swing"; and (5) *spurt*—frequently, in the course of the work, there is an increase in efficiency which lasts for a short time, and which is the result of some newly acquired interest or of encouragement or of the fact that the end of the work is in sight. It is apparent that these factors, like all variable and accidental errors, must be either evaluated or eliminated before the results of tests can be rightly interpreted. Unfortunately, this end has not always been attained, so that results must be accepted with caution. The following conclusions are, however, generally accepted: 1. The feeling of weariness cannot be taken by itself as a criterion of fatigue; some persons are constitutionally "tired," and others never feel weariness until exhaustion is reached. Moreover, an emotion or a stimulant may banish the feeling of weariness for a time, while physiologically the fatigue is not affected. 2. There is a large individual variation in fatigability as a result of general bodily constitution, the age of the individual, climacteric periods, etc. 3. Fatigability is a function of the kind of work and the degree to which the worker has become accustomed to it, and also of such objective conditions as the temperature of the room, ventilation, etc. It follows that no single rule can be laid down whereby the degree of fatigue can be accurately determined by the individual who desires knowledge of his fatigued condition; not only must the sensations of fatigue be taken into account, but a number of other factors also, together with what previous experience has shown to be the probable aftereffects of continued work.

The word "fatigue" is used in various meanings in the psychology of sensation. Thus, in the Young-Helmholtz theory of vision (see Visual Sensation) it denotes a decreased susceptibility of the retina towards light. When a red surface becomes grayish during continued fixation, the red fibre of the retina is said to be fatigued for red light and therefore to function less actively than at the beginning of stimulation. For this concept of fatigue the rival theory of Hering substitutes that of adaptation. (See Afterimages.) Fatigue is also applied, less definitely, to nervous processes in the organ of hearing. A tone, e.g., heard continuously for a long time becomes slightly less intensive. Both here and in sensations of temperature, smell, and taste, where the effect of sustained stimulation is much more noticeable, it is well to substitute the word "adaptation" for "fatigue." Even in vision the mental processes accompanying decreased excitability are entirely different from the fatigue experience which we have discussed above. Consult: Mosso, *La fatigue intellectuelle et physique* (Milan, 1894); *American Textbook of Physiology*, ed. by Howell (Philadelphia, 1898); Titchener, *Experimental Psychology* (New York, 1901); Whipple, *Mental Tests* (Baltimore, 1910); Offner, *Mental Fatigue* (ib., 1911). For the method of exhaustion or adaptation in olfactometry, see Smell.

FATIGUE. In military phraseology, the term applied to such duties of the soldier as have nothing to do with the carrying of arms. The policing of camps or quarters, e.g., is a *fatigue* duty. The *fatigue uniform*, of blue denim, is usually worn in the United States army on such nonmilitary duty, at mountain battery drills, and at "stables." *Fatigue call* is the bugle call assembling men for such work.

FATIGUE OF MATERIALS. See Strength of Materials.

FATIGUE UNIFORM. See Uniform, Military; Fatigue.

FATIMA, fä'tė-mȧ. 1. The name of Mohammed's favorite daughter. 2. A character in the story of Aladdin in the *Arabian Nights*. 3. Bluebeard's last wife, the only one not murdered by him.

FATIMIDES, făt'ĭ-mīdz, or **FATIMITES,** -mīts. The name of a dynasty, called after Fatima the daughter of Mohammed, the prophet of Islam. She married Ali ibn Abu Talib. It is from this family that the dynasty of the Fatimides claims descent. What makes this dynasty of especial interest is that it represents the Shiite element in Islam which still claims that Ali and his two sons should have been recognized as the only legitimate caliphs of Islam. All Shiites agreed that a descendant of this family should be caliph, but, having no principle of primogeniture, there arose a great difference of opinion as to which descendant had the most legitimate claim. This difference of opinion resulted in numerous sects, one of which, the Ismai'lia, claimed that the sovereignty was vested in Isma'il, son of Jafar al-Sadik, great-great-grandson of Ali, through his second son, Hussein. Of this sect Abu Abdallah, famous as al Shii, was the first to gain a firm footing in the Maghrib among the Berber tribe of Kitama, having been invited there by one of their leaders who met him at one of the pilgrimages in Mecca. He began to make his power felt in 895 and gradually succeeded in completely undermining the power of the Aghlabides. Once his position assured, he invited Ubaidallah, who was then the leader of the Ismai'lias, to join him and be proclaimed Mahdi (Messiah). The Abbasides, in constant fear of these Shiite Mahdis, suspected Ubaidallah, watched his movements, and after numerous persecutions succeeded in throwing him into prison when he was on his way to join al Shii. He remained in the prison at Sijilmasa for three years. It was not till 909 that al Shii succeeded in setting him free and finally proclaiming him Mahdi. Enemies of the Shiites add to the doubts cast on the legitimacy of the Fatimide claims by contending that it was not the real Ubaidallah who was freed by al Shii, but a Jew who impersonated him, the real Ubaidallah having already been put to death. However this may be, a man claiming to be Ubaidallah now became the leader of the Fatimides and enforced the Shiite doctrines on the people. Not long after this a quarrel arose between Ubaidallah and al Shii which resulted in the murder of the latter. By 913, the uprisings due to this murder having been quelled, Ubaidallah succeeded in bringing his kingdom into order. He built a new capital south-southeast of Kairawan, where he died in 933, having made two vain attempts to win Egypt from the Abbasides. His son al Ka'im and grandson Isma'il (who took the title of al Mansour) were troubled by the uprisings of Abu Yazid Makhlad al Zenati, who was not successfully defeated till 947. The rest of Mansour's reign was busied with strengthening his kingdom, which was in sad straits after this revolt. It was only on the reign of his son Abu Tamin Ma'ad, who had the title Mo'izz lidin Allah, that the authority of this dynasty began to spread. It was acknowledged over most of the region now constituting Morocco, Algeria, and Tunisia, as well as Sicily. Al Mansour also succeeded in widening his kingdom to the east, and in 972, owing to the aid of his commander in chief Jawar, he entered Cairo, thus adding Egypt to the dominions ruled by the Fatimides. This move, however, resulted in the weakening of Fatimide power in the Maghrib, which gradually became nominal only. On the other hand, numerous attempts were made to conquer Syria, but the Fatimides never gained more than a temporary hold over that country. They were finally driven out entirely by the Seljuks in 1076, Egypt at this time being the only land left to them. The two first caliphs of this period, al Mu'izz and al Aziz, insured their power by a cautious and deliberate policy and a careful organization of the mechanism of administration and finance. The third caliph, al Hakim, proved to be a powerful despot who did great harm to his country. A mystery surrounds his death. Some contend that he was murdered by his sister (who became regent after his disappearance); others that, realizing that he was losing power, he disappeared of his own accord. Thus he became in the eyes of many the Hidden Mahdi in truth, and the Druzes still look for his return. Al Hakim having, as we have said, done more harm than good, was followed by tyrannical regents and weak caliphs who succeeded in undermining the power of this once powerful dynasty. Here and there a strong man comes to the front, attempts to reëstablish order, and to regain lost provinces, but for the most part this period in the rule of the Fatimides is made up of jealousies and assassinations. The result of this was that the country finally fell a prey to the two great Syrian powers, Damascus and Jerusalem. On the death of the last caliph, the unfortunate al Adid, in 1171, the Fatimide family disappeared from history, and Saladin came into the possession of Egypt.

Bibliography. Wüstenfeld, *Geschichte der fatimiden Chalifen* (Göttingen, 1880), in the preface; C. H. Becker, *Beiträge zur Geschichte Aegyptens unter den Islam*, part i, p. 4 et seq. (Strassburg, 1902), gives critical studies of the sources; cf. also Silvestre de Sacy, *Exposé de la religion des Druzes* (Paris, 1838); De Goeje, *Mémoire sur les Carmathes du Bahrein et les Fatimides* (2d ed., Leiden, 1886); Röhricht, *Geschichte des königreichs Jerusalem* (Innsbruck, 1898); A Müller, *Der Islam im Morgen- und Abendland*, i. 595 et seq., ii passim (Berlin, 1885–87); Stanley Lane-Poole, *A History of Egypt*, p. 92 et seq. (New York, 1905).

FATS (AS. *fæt*, Icel. *feitr*, Dutch *vet*, OHG. *feizit*, Ger. *feist*, *Fett*, fat). An important class of substances found in all parts of the animal organism, although they occur mainly in subcutaneous tissue and on the surface of muscles. They are largely taken in ready-formed in the food. Unlike the albuminoids, however, they are also to some extent produced by the animal organism itself. As to their mode of formation, it was for a long time believed that they are derived in the body from sugar, starch, and other carbohydrates; it has, however, been shown that they are produced by the chemical transformation of albuminoids, though the presence of carbohydrates does seem necessary to their formation. The quantity of fat in the human body varies considerably at different periods of life. In the earlier stages of fœtal existence we find scarcely any fat; in new-born children there is usually a considerable quantity deposited under the skin, and the organism continues rich in fat till the age of puberty, when a marked diminution occurs. It again increases about middle life and then occasionally occurs in great excess; e.g., three or four inches of fat are not infrequently found under the skin of the abdomen of corpulent persons. Extraordinary deposits of fat in some particular part of the body are sometimes found both in men and in animals, the remarkable prominence of the buttock in Hottentot women being due to this cause. The uses of fat in the animal organism are manifold. It plays an important part in the process of cell formation; it protects the body from external shocks by a uniform diffusion of pressure through the whole adipose tissue; it checks the loss of heat by radiation; it promotes the mobility of various organs, etc. Its chief use, however, consists in supplying a great part of the heat energy indispensable to animal life, heat being produced in the organism mainly by the combustion of available fat. A moderate accumulation of fat serves as a store of combustible matter in time of need. A superfluous growth of fatty tissue, on the other hand, is a source of great inconvenience and gives rise to the condition known as obesity. See also FATTY DEGENERATION.

The fats are lighter than water; when brought into contact with paper or fabrics, they leave a translucent *grease spot*, which is generally difficult to remove, though it can sometimes be washed out with ether, benzine, chloroform, oil of turpentine, and other organic liquids in which the fats are soluble. To determine the amount of fat in milk, cheese, or any other mixture submitted for examination, the analytical chemist dissolves out the fat with ether, separates the ethereal solution from the other ingredients, evaporates it, dries the residue, and weighs the pure fat thus obtained in a suitable dish. Fats have the peculiar property of forming *emulsions* with water, in which the minute globules of fat often remain in suspension for a very long time; milk is such an emulsion. To emulsify fat artificially, it is melted, if hard, and simply shaken up with water in which some carbonate of soda has been dissolved.

Besides serving as a necessary ingredient of food, fats are applied industrially to many useful purposes. They are often used as fuel and as illuminants and very extensively for the manufacture of soap and candles. Formerly they were much used also as lubricants; in this application, however, they have been largely replaced by oils derived from petroleum.

To obtain the fat, the suet from the animal body is pressed between warm plates or kneaded in muslin bags placed in hot water; the fat melts and is readily separated from the animal membranes. Or else the fat is dissolved out with ether, in which the membranes are insoluble. Another process sometimes employed consists, on the contrary, in dissolving the membranes with dilute acid or alkali, which leaves the fat unattacked. The crude fat may be purified by treatment with sulphuric acid.

Fats are composed of carbon, hydrogen, and oxygen. Their chemical nature was elucidated by Chevreul (q.v.) as far back as 1811. Chevreul showed that fats are combinations of ordinary glycerin and certain so-called *fatty* acids. Glycerin is a triatomic alcohol; i.e., it is capable of combining with three equivalents of a monobasic acid (such as ordinary acetic acid). The combination of an alcohol and an acid is called in chemistry an *ester*, or ethereal salt. The esters of glycerin and stearic, palmitic, and oleic acids are called respectively *tristearin*, *tripalmitin*, and *triolein*. The various fats are mixtures mainly of these esters or "glycerides," containing them in varying relative quantities. Fats, like tallow, containing a large proportion of tristearin and tripalmitin are comparatively hard; on the contrary, lard and similar fats, which are soft and pasty, are found to contain a high percentage of triolein. The color, state, consistency, etc., of fats vary with the source from which they are derived. The fat of carnivorous animals has a peculiar disagreeable odor and is not so hard as that of herbivora. *Human fat* contains, besides tripalmitin, triolein, and some tristearin, also a yellow substance resembling bile by its odor and bitter taste. The animal secretions all contain a certain amount of fat; ear wax, e.g., has been shown to contain some tristearin and some triolein. *Butter* contains about 87 per cent of fat, including a considerable amount of tributyrin (the ester of glycerin and butyric acid); *oleomargarine*, prepared from the best beef tallow, differs but slightly in composition and nutritive properties from butter.

When exposed to the action of steam heated to a temperature of 400° F. (about 200° C.), all fats and fatty oils are decomposed into their chemical constituents. The same action takes place in the presence of moisture, though much more slowly, at ordinary temperatures (the rancidity of fat is due to the separation of free acids, and may therefore be removed by dissolving out the acids with water). A similar decomposition takes place in the animal organism; steapsin, one of the pancreatic ferments, splits up and emulsifies fat in the process of digestion. Even more readily than with hot steam, and at a much lower temperature, is the decomposition of fat effected with caustic alkalies. When fats are treated with sodium or potassium hydroxide, the metal takes up the acid of the fat, forming the salts known in common life as *soap*, while the glycerin of the fat is set free. The process is extensively employed in the manufacture of soap and is therefore generally spoken of by chemists as the *saponification* of fats. See ESTERS.

In the animal organism, or when heated with free access of oxygen, fats are burned (oxidized) completely, yielding, like other compounds of carbon, water and carbonic acid. But when they are burned incompletely, as sometimes in careless cooking, a number of combustible gases are produced, including the vapors of acrolein, to which the irritating odor of superheated fat is due. See OILS.

FATSHAN, făt'shăn, or **FU-SHAN**. A great trading mart and manufacturing centre in the Province of Kuang-tung, South China, second in importance to Canton (q.v.). It is one of the five *chen*, or great marts, of the country, the others being King-te-chen in Kiang-si, Siang-t'an in Hu-nan, Hankow in Hupe, and Si-an-fu in Shen-si. It is situated on one of the branches of the river delta to the right bank of the Chu-kiang, or Pearl River, near the mouth of the North River, 12 miles southwest of Canton. It has a population estimated at 450,000. Its industries include the manufacture of cloth, silk, paper, embroideries, firecrackers, porcelain, rattan, bamboo, and brass wares; but it is especially noted for its iron and steel manufactures and has been called "the Birmingham of China." Whole cargoes of old horseshoes and old iron of all kinds are annually shipped to it from Great Britain for use in this industry. Fatshan also does a large business in cassia, grain, oil, and timber. The town is facilitating the immense traffic with Canton. It has a telegraph station, two churches, and the Wesleyan Hospital, with accommodation for 1000 patients. It is said that before the expulsion of the Jesuit and other missionaries the Christians of Fatshan numbered 10,000, but no trace of them is now to be found.

FATTORI, făt'tō-rē, GIOVANNI (1828–). An Italian military painter, born in Livorno. He was a pupil of Giuseppe Bezzuoli and the Florence Academy, and later came under the influence of the school of Morelli. The success of his first important work, "The Battle of Magenta" (1859), led him to make a specialty of military life, every aspect of which he painted. He is a naturalist as regards color and treatment of atmosphere and shows his academic training only in his correct draftsmanship and grouping of figures. In 1877 he became a professor in the Academy of Florence and a member of that of Bologna. Other paintings of his are "The Forty-ninth Regiment at Custozza" (National Gallery, Rome) and "The Wounding of Prince Amadeo at Custozza" (1870; Brera, Milan). Some few genre pictures also are from his brush, including "The Horse Market in the Piazza Montanara, Rome," and "The Horse Market in Terracina." He received a gold medal at Paris in 1900 and medals at the Vienna and Philadelphia expositions.

FATTY DEGEN'ERA'TION. A pathological term signifying the gradual replacement by fat globules of the tissues of a living body, impairing and finally destroying them. These globules, though originating in the living tissues and existing among them, have in themselves no element of life; hence, when they replace living tissues, they are destructive of them. Fatty degeneration must be distinguished from obesity, which is simply excessive deposition of fat between the tissues. The disease is of frequent occurrence and attacks nearly all the tissues, particularly the muscular and cellular, as in the heart and liver, which organs are often the seats of the disease. The red blood globules and the nerves are probably never attacked by it. The older view that fat found in cellular tissue was a result of the transformation of proteid into fat is now known to be erroneous. The chief source of the oil globules is the fat brought to the cell as nourishment by the blood and lymph and not utilized. Fatty degeneration is caused in one of two ways: (1) from a deficient supply of oxygen (seen in embolism (q.v.), thrombosis (q.v.), or anæmia, general or local); or (2) by the direct injurious action of poisons, such as phosphorus or chloroform, which act principally on the liver, or the toxin of diphtheria, which attacks the nerves and striated muscles. Injured cells containing little fat may recover; where the process has advanced beyond a certain point, recovery is impossible. Consult Mallory, *Principles of Pathological Histology* (Philadelphia, 1914).

FAUBOURG, fō'bōōr' (OF. *forbourg*, from *fors*, Fr. *hors*, from Lat. *foris*, outside, beyond + *bourg*, from Lat. *burgus*, OHG. *burg*, Ger. *Burg*, AS. *burh*, Eng. *borough;* formerly written also *faux-bourg*, false town, by popular etymology). A suburb in French cities, a part of the town now indeed within the walls (or the town limits), but which was without them when, in former days, the walls were less extensive.

FAUCES, fą'sēz (Lat., throat). The back part of the mouth, consisting of the passage from the cheek cavity proper to the cavity of the pharynx. Above the fauces is the soft palate, and on either side are the pillars of the fauces, between the folds of which lie the tonsils (q.v.). See Tongue; Palate; Pharynx.

FAUCHE, fōsh, Hippolyte (1797–1869). A French Orientalist, born at Auxerre. After writing a theological poem, *Panthéon* (1842), and a novel, *La sœur Gabrielle* (3 vols., 1844), he devoted his life and fortune to the task of translating into French various Sanskrit works. Among these are: *Gîta Govinda ou le Ritou Sanhara* (1850); *Bhartrihari et Tchaura* (1852); a part of the *Rāmāyana* (1854–58, in 9 vols.; abridgments, in 2 vols., 1869; and in 1 vol., 1892); *Œuvres complètes de Kalidasa* (2 vols., 1859–60); *Une tétrade*, containing the *Mritchiakatika* of Sudraka, the *Doçakowmarat-charita*, the *Mahimnastava*, and Magha's epic *Sisoupâla-Vadha* (2 vols., 1861–63); and about a third of the *Maha-Bharata*, in 10 vols. (1863–72). These translations contain many errors, as was inevitable considering the difficulties under which he labored, but they are marked by much sympathy for the original and by frequent felicity of rendition.

FAUCHE-BOREL, bō'rĕl', Louis (1762–1829). The principal agent of the Bourbons from the beginning of the Revolution. He was born at Neuchâtel, became a printer, conducted the negotiations with Pichegru for the restoration of the Bourbons, and for that purpose set up as a publisher at Strassburg. Here he was captured by order of the Directory in 1795, but was released for lack of evidence. After the flight of Pichegru to England Fauche-Borel continued the negotiations with Barras and was banished from France. Nevertheless he undertook to circulate the manifesto of Louis XVIII even after the accession of Napoleon to the throne. After eight years in England and Sweden he returned to France in 1814 with the allied armies and was employed in certain secret negotiations. He subsequently became Prussian Consul-General at Neuchâtel. His services were unrecognized by the Bourbons until the accession of Charles X, when he received a pension of 5000 francs. His interesting *Mémoires* were published after his death by Beauchamp (4 vols., 1828–29). Consult Barbey, "Les mémoires de Fauche-Borel," in *Revue Historique*, vol. ci, pp. 326–333 (Paris, 1909).

FAUCHER, fō'shā', Julius (1820–78). A German free trader. He was born and educated in Berlin, his family being of French Huguenot extraction. He early became a disciple of Adam Smith and a defender of the policy of Cobden and the English free traders. In 1850 he founded the Berlin *Abendpost*, the first free-trade journal of Germany; and with Wiss, Beta, Prince-Smith, and others he organized in 1846 the first German free-trade society, afterward known as the Economic Society of Berlin. Upon the suppression of the *Abendpost* Faucher went to England, where in 1856 he became one of the editors of the *Morning Star*, the first free-trade paper in London. In 1861 he returned to Germany and began a vigorous agitation for liberty of domicile, industrial freedom, and free international commerce. He was elected member of the Prussian Diet in the same year. In 1863 he founded with Michaelis the *Vierteljahrsschrift für Volkswirtschaft, Politik, und Kulturgeschichte*, which he edited until 1877. During the campaign of 1870–71 he accompanied the German army as correspondent of the London *Daily News*. In 1872 he returned to London. He died in Rome. Besides contributions to economics, which appeared in the *Vierteljahrsschrift*, he published books of travel: *Ein Winter in Italien, Griechenland und Konstantinopel* (1876); *Vergleichende Kulturbilder aus den vier europäischen Millionenstädten* (1877); *Streifzüge durch die Küsten und Inseln des Archipels und des ionischen Meeres* (1878); and an essay, "Russian Agrarian Legislation in 1861," in *System of Land Tenure in Various Countries* (3d ed., 1881).

FAUCHER, Leonard Joseph (Léon) (1803–54). A French publicist and political economist. He was born at Limoges and was educated at Toulon and Paris. He became editor in chief of the *Temps*, *Courrier de Paris*, and *Constitutionnel;* was one of the principal advocates of free trade, and a frequent writer on economics in the *Siècle* and the *Revue des Deux Mondes*. After the revolution of 1848 he was elected to the Legislature and upon the election of Louis Napoleon to the presidency was appointed Minister of Public Works (Dec. 20, 1848) and soon afterward Minister of the Interior, as successor to Léon de Maleville. He retired from public life in 1851. A collection of his economic works is included in the *Mélanges d'économie et de finance*, published by the economist Wolowski, Faucher's brother-in-law (2 vols., 1856). He also wrote *Etudes sur l'Angleterre* (2 vols., 1844). Consult *Léon Faucher, biographie et correspondance* (2 vols., 2d ed., Paris, 1875).

FAUCHER DE SAINT-MAURICE, fō'shā' de săɴ' mō'rēs', Narcisse Henri Edouard (1844–97). A French-Canadian journalist and author. He was born at Beaumont, Bellechasse, in the Province of Quebec, was educated at the seminary there and at the College of Ste. Anne de la Pocatière, and in 1864 went to Mexico, where he became captain in the army of Maximilian and afterward aid-de-camp to Gen. Viscount d'Hurbal. For valor and integrity he was created a knight of the Imperial Order of Guadeloupe by Maximilian and was given the medal of the Mexican campaign by Napoleon III. Returning to Quebec in 1866, he was appointed clerk of the Legislative Council of the Province of Quebec—a post which he held for 14 years.

As editor of *Le Journal de Québec* (1883), and subsequently of *Le Canadien*, he had a brilliant career in journalism. For his services to France in the Canadian press he was created a chevalier of the Legion of Honor (1881). In general literature Faucher is best known for his sympathetic descriptions of historical places along the St. Lawrence. Among his separate publications are: *A la brunante, contes et récits* (1873); *De Québec à Mexico* (1866); *Choses et autres* (1873); *De tribord à bâbord: trois croisières dans le golfe du Saint-Laurent* (1877); *A la veillée* (1878); *Deux ans au Mexique* (1878); *En route: sept jours dans les provinces maritimes* (1888); *Joies et tristesses de la mer* (1888); *Loin du pays* (1889).

FAUCIT, fą'sit, HELENA SAVILLE (1817–98). An English actress, born in London. She was the daughter of an actor, John Saville Faucit, and made her début as Juliet, at Richmond, in 1833, winning at once a great reputation. She became the leading lady in Macready's Shakespearean revivals, was the original impersonator of the heroines in Bulwer's, Browning's, and other modern plays, and also supported Irving (1857). After her marriage in 1851 to Theodore Martin, afterward Sir Theodore, she continued occasionally to appear on the stage, though later than 1864 she rarely did so except for a charitable object. One of her last appearances was as Beatrice at the opening of the Shakespeare Memorial Theatre at Stratford in April, 1879. She was the friend of many noted people and a reader to Queen Victoria. In 1887 she published *On Some of the Female Characters of Shakespeare.* Her death occurred near Llangollen, Wales. Consult *Actors and Actresses of Great Britain and the United States*, ed. by Matthews and Hutton (New York, 1886), and Sir Theodore Martin's *Helena Faucit* (London, 1900).

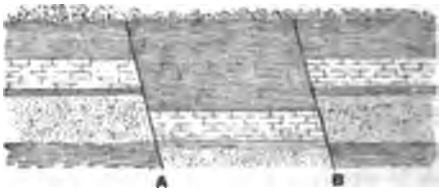
FAUJAS DE SAINT-FOND, fō'zhä' de săN'fôN', BARTHÉLEMY (1741–1819). A French geologist and paleontologist, born at Montélimar. As an expert geologist he was sent as commissioner of the King on extensive travels for the purpose of making an especial study of the products and phenomena connected with volcanoes. He was professor of geology at the Jardin des Plantes, Paris, from 1793 to 1818. His works include: *Recherches sur la pouzzolane* (1778); *Recherches sur les volcans éteints du Vivarais et du Velay* (1778), in which he formulates a new volcanic theory; *Histoire naturelle de la province de Dauphiné* (4 vols., 1781–82); *Minéralogie des volcans* (1784); *Voyage en Angleterre, en Ecosse et aux Hebrides* (2 vols., 1797; Eng. trans., 1799, and new ed., 1907); *Essai de Géologie* (2 vols., 1803–09).

FAULKNER, fąk'nẽr, CHARLES JAMES (1806–84). An American lawyer and politician. He was born in Martinsburg, Va. (now West Virginia), was educated at Georgetown University, and was admitted to the bar in 1829. In 1832 he was elected to the Lower House of the Virginia Legislature. In 1848 he introduced in the Virginia House of Delegates a law after which the Fugitive Slave Law of 1850 was modeled. From 1851 to 1859 he was a member of Congress from Virginia. In 1859 he was appointed by President Buchanan Minister to France, where his action in influencing Louis Napoleon to favor the Confederacy led to his recall by President Lincoln in 1861. Upon his return to the United States he was arrested and confined in Fort Warren, Boston harbor. When released, he went south and served in the Confederate army on the staff of Stonewall Jackson. After his political disabilities were removed, in 1872, he was a member of the State Constitutional Convention in West Virginia in that year and was again a member of Congress from 1875 to 1877.

FAULKNER, JOHN ALFRED (1857–). An American church historian. He was born at Grand Pré, Nova Scotia, graduated at Acadia College, 1878, at Drew Theological Seminary, 1881, studied at Andover and Leipzig, and, after several pastorates, became professor of church history at Drew, 1897. He contributed to Hurst's *History of the Christian Church* (1897–1900) and wrote: *The Methodists* (1903); *Cyprian* (1906); *Erasmus* (1908); *Crises in the Early Church* (1912).

FAULMANN, foul'mȧn, KARL (1835–94). An Austrian stenographer and author, born at Halle, Germany. He began to teach the Gabelsberger system in 1861, was member of a commission appointed to investigate the teaching of stenography in 1868, and was made a professor of stenography in 1884. He edited several stenographic journals and invented a system of phonography (published by Brant in 1875). Based upon a radical reform of the Gabelsberger system, it is easy of comprehension, but less pliable and characteristic than the system it aims to supplant. It has been adapted to the French, Czech, and Servian languages. The principal works of Faulmann are the following: *Lehrgebäude* (35th ed., 1899); *Anleitung zur phonetischen Stenographie* (6th ed., 1896); *Die Phonographie in ihrem Verhältnis zur Kurrentschrift und Stenographie* (1878); *Das Buch der Schrift* (2d ed., 1880); *Geschichte und Litteratur der Stenographie* (1895).

FAULT (OF., Fr. *faute*, Sp., Portug., It. *falta*, flaw, from Lat. *fallere*, to deceive, Gk. *σφάλλειν*, *sphallein*, to slip, Skt. *phal*, to deceive, Lith. *pùlti*, OHG. *fallan*, Ger. *fallen*, Icel. *falla*, AS. *feallan*, Eng. *fall*), or DISLOCATION. In geology, a displacement of rocks along a plane of fracture. The plane of fracture may be inclined at any angle to the horizon, and the displacement may be vertical or horizontal, but usually both. The angle made by the fault plane with a vertical plane is called the "hade" or "slope" of the fault. The inclination of the fault plane with the horizontal plane is called the "fault dip." Where the displacement is partly vertical, the side on which the rocks lie at a higher level than that of their continuations across the fracture is called the "upthrown side," and the other is called the "downthrown side." Also the side towards which the fault plane dips is called the "hanging wall," while the other side is called the "footwall." The "throw" of a fault is its vertical displacement. The horizontal displacement is sometimes called the



SECTION SHOWING FAULTS.
a, normal fault; *b*, reversed fault.

"heave." Where the hanging-wall side of a fault is depressed with reference to the footwall side, the fault is said to be a *normal* or *gravity* fault. Where the hanging-wall side is thrust up over the footwall side, the fault is said to be a *reversed* or *thrust* fault. In a gravity fault the dip of the fault plane is usually great; in a thrust fault, small. This displacement in normal faults is due to gravity and causes the affected bodies to occupy greater horizontal area. The displacement of a thrust or reversed fault originates in compression of the rock mass.

In general, faults are one of the manifestations of the deformation which rocks undergo in the outer parts of the earth's crust where they yield by fracture. (See Crust of the Earth.) Faults are accompanied by various phenomena such as brecciation, jointing (see Joints), and slickensiding, which are the common accompaniments of relief from pressure. While faults with marked throws are not very frequent, it is difficult to find a fracture in the earth's crust where some slight displacement of the parts has not occurred, for fractures develop in the relief of rocks from pressure, and relief cannot be obtained without at least a slight differential movement. In mountain masses the displacement by faulting may amount to hundreds, or even thousands, of feet. The development of such great faults has resulted probably from repeated small movements along the fault fissures rather than by single displacements. The movement, when sudden, is accompanied by earthquakes, and it is now known that faulting is the proximate cause of most of the powerful earthquakes, e.g., such as the more recent disturbances in India, California, and Messina. Consult "Report of the Committee on the Nomenclature of Faults," *Bulletin of the Geological Society of America*, vol. xxiv (Washington, 1913). See Mountain; Geology.

FAUNA. An ancient Italian divinity. See Faunus.

FAUNA. The indigenous animals of a designated place, region, or space of time, considered collectively—the correlative of "flora" (q.v.). The space in view may be a geographical surface, as a country or a certain neighborhood, or it may be a certain environment. Moreover, the word is frequently compounded, as "avifauna," "piscifauna," etc., in order to designate that only the birds, fishes, or other single group of the given region are under consideration. Conversely, a district characterized by a fauna of any particular nature is spoken of as a "faunal region." For further elucidation of these definitions, see Distribution of Animals.

In geology and paleontology the term is employed in a sense somewhat different from that in which it is used by the zoölogist. The paleontologist conceives of a "fauna" as an assemblage of animals inhabiting a particular region during a geologic hemera, epoch, or period. The fossil remains of such a fauna would be found scattered through the successive layers of all the deposits formed during the period of its existence. Such a fossil fauna undergoes changes in its make-up; some species drop out, other new ones come in from adjoining provinces, and the species themselves often exhibit evolutional changes. The broader the use of the term, the more apparent the modifications of the fauna. Thus the "Ordovician fauna" of New York State is a comprehensive use of the term and involves a large, heterogeneous assemblage of fossil organisms; but the "Upper Chazy" fauna of the Champlain valley is a more restricted use and refers to a concrete, homogeneous member of the larger group. For further discussion, see Paleontology.

FAUNCE, Daniel Worcester (1829–1911). An American clergyman, father of William H. P. Faunce, born at Plymouth, Mass. Graduating from Amherst College in 1850, he then studied at the Newton Theological Institution, was ordained to the Baptist ministry in 1853, and thereafter held charges from 1853 to 1866 in Somerville, Worcester, and Malden—all in Massachusetts—in Concord, N. H. (1866–75), Lynn, Mass. (1875–81), Washington, D. C. (1881–89), West Newton, Mass. (1889–93), and Pawtucket, R. I. (1894–99). He was a member of the board of managers of the American Baptist Missionary Union. His works include: *Words and Works of Jesus* (1873); *Words and Acts of the Apostles* (1874); *The Christian in the World* (1875); *A Young Man's Difficulties with his Bible* (1877); *The Christian Experience* (1880); *Hours with a Sceptic* (1889); *Prayer as a Theory and a Fact* (1890); *Advent and Ascension* (1893); *Shall We Believe in Divine Providence?* (1900); *The Mature Man's Difficulties with his Bible* (1908).

FAUNCE, William Herbert Perry (1859–). An American clergyman and educator, born at Worcester, Mass. He graduated in 1880 at Brown University (where he then taught mathematics for a year), and in 1884 at Newton Theological Seminary, and from 1884 to 1889 was pastor of the State Street Baptist Church of Springfield, Mass. From 1889 to 1899 he was pastor of the Fifth Avenue Baptist Church of New York City, in 1896–97 he lectured in the Divinity School of the University of Chicago, and in 1898–99 he was a member of the board of resident preachers of Harvard University. In 1899 he became president of Brown University; during his administration the endowment of the university was largely increased. He was Lyman Beecher lecturer at Yale in 1907–08 and was prominent in the work of the Religious Education Association. His writings include numerous contributions, chiefly to religious periodicals, and the volumes *The Educational Ideal in the Ministry* (1909) and *What Does Christianity Mean?* (1912).

FAUN OF PRAXIT'ELES, The. The usual designation of a marble statue in the Capitoline Museum, Rome. It is a copy of a celebrated bronze original by Praxiteles (q.v.), which stood in the street of the tripods in Athens. The figure is, properly speaking, a satyr, who is represented leaning in an easy and graceful position against the trunk of a tree. This is probably the first instance in Greek sculpture in which a satyr is represented without any animal attributes except the pointed tips of the ears. This figure suggested the title of Hawthorne's *Marble Faun*, in which a subtle description of the statue is given.

FAU'NUS. Faunus is an early Italian god of the country and especially of life on the farm; a god of fruitfulness in fields and flocks, a kindly divinity (the name may well be derived from Lat. *favere*, to favor). He dwelt in the hills and the woods and was worshiped there. He was also gifted with prophecy, and to him were attributed the strange voices and sounds heard in the woods. His companion divinity was the goddess Fauna, his wife or his sister. This old Roman god was identified by Roman poets with the Greek Pan and under the influence of Greek models assumed the form and attributes of that deity. From this also developed the conception of fauni, or fauns, creatures like the Greek satyrs, with pointed ears, goats' hoofs and tails. In art the later Greek conception minimized the goat nature. Under the euhemeristic tendencies of the time Faunus entered the list of the early Latin kings as the father of Latinus, son of Picus, and representative of the early civilization. In some of the villages a festival in honor of Faunus, called Faunalia, seems to have been held on December 5, but in Rome the great festival of the *Lupercalia*, (q.v.), on February 15, was celebrated in his honor. In the country wine and milk were offered to him, and he was implored to be gracious to fields and flocks. Consult Horace, *Carmina*, iii, 18, and Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

FAUQUE DE JONQUIÈRES, fōk de zhôɴ′kyâr′, JEAN PHILIPPE ERNEST DE (1820–1901). A French mathematician and naval officer, born at Carpentras. As chief of staff to Admiral La Grandière in Cochin-China, he organized at Saigon the first agricultural and industrial exposition in the French Asiatic possessions. He was appointed vice admiral Oct. 1, 1679, and in 1883 became director of the Bureau of Charts and Plans. His mathematical works include: *Mélanges de géométrie pure* (1856); *Essai sur la génération des courbes géométriques* (1859); *Théorèmes fondamentaux sur les séries de courbes et de surfaces algébriques, etc.* (1865). He also translated into French the *Epistles* and the *Art of Poetry* of Horace.

FAUQUIER, fa̤′kwēr, FRANCIS (c.1704–68). A Colonial governor of Virginia. He succeeded Dinwiddie as Lieutenant Governor of Virginia in 1758 and retained this office until his death. In 1765, upon the passage of Patrick Henry's famous Stamp Act resolutions, he dissolved the Virginia House of Burgesses. He also opposed the assembling of the Stamp Act Congress and by refusing to summon the newly elected House of Burgesses prevented the Colony of Virginia from choosing delegates in compliance with the invitation of Massachusetts. Fauquier was not unsympathetic with the colonists in their struggle for self-government and did not come into violent conflict with them as Dinwiddie did. He published *An Essay on Ways and Means of Raising Money for the Support of the Present War, without Increasing the Public Debts* (1756).

FAURE, fōr, (FRANÇOIS) FÉLIX (1841–99). A French statesman, President of the French Republic from 1895 to 1899. He was born in Paris, the son of a cabinetmaker, studied in a Christian Brothers' School in Paris, and in an English school in Surrey. He learned the trade of a tanner, and removed (about 1862) to Havre, where he entered the employ of a large leather firm, of which he became the controlling partner. He was president of the Chamber of Commerce at Havre on the breaking out of the Franco-Prussian War, through which he served as a captain in the Garde Mobile. In 1881 he first entered politics, being elected to the Chamber of Deputies from Havre as a moderate Republican, and was chosen Undersecretary of State for Commerce and the Colonies in the Gambetta cabinet until January, 1882. He held the same position in the cabinet of M. Ferry in 1883–85. In the Chamber of Deputies he became the chief spokesman of the group known as Union Republicans. In the short-lived cabinet of M. Tirard (January to February, 1888), he was for the third time Undersecretary for Commerce and the Colonies. He continued to serve in the Chamber of Deputies, being elected its Vice President in 1893. Upon the election of Casimir-Périer to the presidency in 1894, Faure became Minister of Marine in the cabinet of M. Dupuy. When Casimir-Périer suddenly resigned the presidency in January, 1895, Faure was elected his successor as a compromise candidate, the moderate Republicans blocking the choice of Brisson (who got 338 votes to Faure's 224 on the first ballot) and the Radicals preventing the election of Waldeck-Rousseau (who had 184 votes), who threw his strength to Faure to defeat Brisson.

Faure was not a great statesman, and his career as president was not brilliant, but he was conservative and safe. His administration was a quiet one. The Franco-Russian alliance was the only step of any importance in the Republic's foreign relations, and the unfortunate Fashoda affair was happily terminated. In 1898 his opposition to the agitation for a retrial of Dreyfus caused considerable feeling. Faure himself as President assumed an almost monarchical pomp; and his wife took official rank—the first time under the Republic. He was stricken with apoplexy, and died on Feb. 16, 1899. There is little reason to believe the stories in the *Mémoires* (1912) of Madame Steinheil that she was the President's intimate friend. Faure's *Les budgets contemporains* (1887) received a prize from the French Academy.

FAURÉ, fō′rā′, GABRIEL URBAIN (1845–   ). A French composer, born at Pamiers. He studied in Paris under Niedermeyer, Dietsch, and Saint-Saëns, and began his career in 1866 as organist at Rennes. In 1870 he went to Paris as assistant organist at Saint-Sulpice. Later he became organist at Saint-Honoré, and in 1896 at the Madeleine. In the same year he succeeded Massenet as professor of composition at the Conservatory. Upon the resignation of Dubois in 1905 he became the director. In 1909 he succeeded to Reyer's seat in the Académie. Twice, in 1885 and 1893, he won the much-coveted Prix Chartier for chamber music. His compositions include a symphony in D minor, a violin concerto, an orchestral suite, an elegy for violincello and orchestra, a requiem, a choral work (*La naissance de Vénus*), incidental music to several dramas (*Caligula*, *Shylock*, *Pelléas et Mélisande*, *Prométhée*), an operetta (*L'Organiste*, 1885), and an opera in three acts (*Pénélope*, 1913). But his talent is shown to best advantage in his chamber music (a sonata for violin and piano, several quartets and quintets). Among his numerous songs are many of rare excellence.

FAURE, JEAN BAPTISTE (1830–1914). A French barytone and composer, born at Moulins. When 13 years old, he entered the Paris Conservatory and became a chorister at the Madeleine, where his instructor was Trévaux. After having won first prize in the comic-opera class at the Conservatory, he made his professional début at the Opéra Comique in 1852. His first triumph came in 1857, and two years later Meyerbeer wrote for him the rôle of Hoël in the *Pardon de Ploërmel*. In 1861 he appeared at the Grand

Opéra, and his subsequent career was a repetition of successes. In 1857 he had become a professor at the Conservatory. For a time he sang in London and in Germany, but in 1876 left the opera and thereafter appeared only in concerts. In 1881 he was made a chevalier of the Legion of Honor. As a composer, Faure was well known for his sacred songs, many of which largely owed their popularity to his interpretation. In 1886 he published *La Voix et le Chant*, a treatise, with numerous exercises, on vocalization.

FAURIEL, fō'ryĕl', Claude Charles (1772–1844). A French philologist, historian, and critic, born at Saint-Etienne. From 1830 until his death he was professor of foreign literature at the Sorbonne. In 1836 he published his chief work, *Histoire de la Gaule méridionale sous la domination des conquérants germains* (4 vols.), which constituted a section of an extensive projected history of culture and literature in France. Worthy of notice, also, particularly on account of its historical introduction, is his edition of the Provençal rhymed chronicle, entitled *Histoire de la croisade contre les hérétiques albigeois* (1837). After his death there appeared two collections of his lectures, *Histoire de la poésie provençale* (1846) and *Dante et les origines de la langue et de la littérature italiennes* (2 vols., 1854). His works served to stimulate the study of the literature of the Middle Ages, though his learning is frequently more extensive than exact. Consult J. B. Galley, *Claude Fauriel* (Saint-Etienne, 1909), and also *Correspondance de Fauriel et Mary Clarke* (Paris, 1911).

FAUSBÖLL, fous'bĕl, Michael Viggo (1821–1908). A Danish philologist and Pāli scholar, born at Hove, near Lemvig. In 1861 he received an appointment in the library at Copenhagen, and in 1878 he was made professor of Indo-Oriental languages in the University. He died in Copenhagen on June 3, 1908. His chief work was in the editing of Pāli texts and in thus spreading a knowledge of the Buddhist sacred books. Among his important publications are: *The Dhammapadam*, with a translation and commentary in Latin (Copenhagen, 1855; 2d ed., London, 1900); *Five Jātakas*, with English translation (1861); *Two Jātakas* (1870); *Dasaratha Jātaka* (1871); *Ten Jātakas* (1872); *The Jātakas*, with an English commentary in 6 vols. (London, 1877–96); *Indian Mythology according to the Mahābhārata* (1903). He wrote also many works under the pseudonym of V. Kristiansen, among which the *Dictionnaire de la langue des rues* (1866) may be mentioned.

FAUS'SET, Andrew Robert (1821–1910). A biblical scholar of the Church of England, born at Silverhill, Ireland. He graduated at Trinity College, Dublin, in 1843, became rector of St. Cuthbert's, York, England, in 1859, and canon of York in 1885. With Robert Jamieson and David Brown he prepared a commentary on the whole Bible entitled *The Library Commentary* (London, 1868); separately he issued the well-known *Horæ Psalmicæ* (1877; 3d ed., 1885); *The Englishman's Critical and Expository Bible Cyclopædia* (1879; 3d ed., 1891); *Signs of the Times* (1896).

FAUST. An opera by Gounod (q.v.), first produced in Paris, March 19, 1859; in the United States, November 18, 1863 (Philadelphia).

FAUST, foust, Albert Bernhardt (1870–). An American Germanic scholar. He was born at Baltimore, Md., and was educated at Johns Hopkins (A.B., 1889; Ph.D., 1892), where he was an instructor in German in 1894–96. For the next seven years he was associate professor of German at Wesleyan University (Connecticut). He was assistant professor of German at the University of Wisconsin (1903–04) and at Cornell University (1904–10) and after 1910 held a full professorship at the latter institution. He edited *Zschokke's Tales* (1895) and *Heine's Prose* (1909). Besides several essays on German literary subjects, he is author of *Charles Sealsfield (Carl Postl), Der Dichter beider Hemisphären* (1897), and *The German Element in the United States* (1909; Ger. trans., 2 vols., 1911), for which he was awarded prizes by the University of Chicago and the Royal Prussian Academy.

FAUST, Bernhard Christoph (1755–1842). A German physician. He was born at Rotenburg, Hesse, was educated at Göttingen and Rinteln, and in 1788 became physician in ordinary at Bückeburg. He was one of the first physicians in Germany to adopt vaccination and published on that subject: *Ueber die Kuhpocken und deren Impfung* (1801) and *Oeffentliche Anstalten, die Blattern durch Einimpfen der Kuhpocken auszurotten* (1804). The most important of his numerous hygienic works is the *Gesundheitskatechismus zum Gebrauche in den Schulen und beim häuslichen Unterricht* (1794, and frequently republished). Of the three English translations of the work, the latest is entitled *A New Guide to Health, Compiled from the Catechism of Dr. Faust* (1832).

FAUST, or **FAUS'TUS**, Johann, or Georg (c.1485–c.1540). A German charlatan, astrologer, and soothsayer, supposed to have lived in the first half of the sixteenth century and to have performed marvels by the aid of the devil and to have been carried away by him at his death. Philip Begardi, a physician, mentions such a person in his *Index Sanitatis* published at Worms in 1539. The tales gathering about such a nucleus made their first appearance in literature as *Historia von Dr. Johann Fausten* at the book fair at Frankfort-on-the-Main in 1587. This relates how the son of a peasant achieves distinction at the University of Wittenberg, but seeks to deepen his knowledge by magic arts, secures a devil, Mephistopheles, for his servant for 24 years, after which Faust is to belong to the devil. This compact is sealed in Faust's blood. The devil amuses Faust and his professorial famulus Wagner with high living, sexual indulgence, long theological and philosophical discussions, and visions of the spirit world. This rouses remorse, and Faust seeks consolation in mathematics, afterward visiting hell and the stars, making wide travels, playing magic pranks, sharing in student revelry, conjuring the Grecian Helen from the nether world, living with her as concubine, and begetting a soothsaying child, called Justus Faust. When the 24 years are over, the devil carries away Faust, who ruefully points the moral of his folly. In the Faust legend one sees the Protestant theology of the Reformation expressing its views of the intellectual freedom of the Renaissance.

This tale was rendered into metrical English in 1587 and was turned into German rhymes in 1588. In 1599 the tale appeared with an elaborate commentary by G. R. Widman (consult Scheible's *Kloster*, vol. ii, pp. 273 ff., Stuttgart, 1845–49), furnishing apparently the main source of subsequent versions. In 1589 a French version appeared by Victor Palma Cayet. The German version was done into English prose, and of this there was a revision in 1592, with a Dutch version of the same year, in which the death of Faust is dated Oct. 23–24, 1538: Soon after the story first reached England its central thought was seized on by Marlowe in his powerful drama *The Tragedy of Dr. Faustus*, written as it seems in 1589, though not entered at Stationers' Hall till 1601. Marlowe follows the legend closely.

An interesting parallel between Faust and Luther has been drawn by Scherer.

Faust brings to the University of Wittenberg "a foolish and arrogant mind," seeking to explore nature beyond scholarly tradition and so led to classical culture and to the devil. The Luther of history and the Faust of the legend both lectured on ancient culture. Faust yields to it and Helena. Luther marries after the Christian ordinance. Luther clings to his Bible. Faust would explore behind and beyond it. Luther fights with the devil; in the legend, Faust compacts with him. Both visit Rome. Luther is roused to revolt, Faust is amused and cynical.

It was the melodramatic and spectacular elements in his drama, however, that made it hold the stage, and after Marlowe's death (1593) these were still further accentuated, so that when English actors brought the drama back to Germany it was essentially a popular, not to say a vulgar, spectacle, in which a clown, who in Goethe's drama has become Wagner, representing the shrewd philistine common sense of the middle class, is accorded the chief part. It also appeared as a puppet play, a Punch and Judy show to amuse children; and thus it was seen by the boy Goethe, as a modification of it may yet be seen by the German children of to-day. The situation, however, made possible a dramatic treatment of the deepest problems of man's mortal existence. This was widely perceived. Lessing essayed the subject in 1759. Friedrich Müller, known as "Maler" Müller, published in 1778 two fragments of a dramatized *Fausts Leben*. Klinger, of the Storm and Stress, published (1791) a romance on *Fausts Leben, Thaten und Höllenfahrt* (trans. by Borrow, 1826). Goethe, who had begun work on the subject as early as 1773 and committed several scenes to friends in the so-called *Göchhausen-Faust* (discovered in 1887), published *Faust, ein Fragment*, in 1790, the complete first part in 1808. The second part appeared posthumously in 1832. Klingemann wrote a tragedy (1815), Lenau a tragedy (1836), Heine a ballet (1851), on *Faust*. Many others have made use of the material. Goethe's *Faust* was adapted to the English stage by W. G. Wills in 1885 and produced with much splendor and success by Sir Henry Irving. Of Goethe's *Faust* there are many English translations, of which Bayard Taylor's is the best. The most convenient *Bibliography* of the older Faust literature is K. Engel's *Zusammenstellung der Faust-Schriften* (Oldenburg, 1885). Consult introduction to Thomas's *Goethe's Faust* (2 vols., Boston, 1912).

FAUST, or **FUST**, JOHANN. See FUST.

FAUS'TA, FLAVIA MAXIMIANA (289–327). A Roman empress, a daughter of Maximianus, a colleague in the Empire with Diocletian, and compelled to abdicate with him. Fausta became the second wife of Constantine the Great in 307 A.D. She was ambitious and was constantly meddling in affairs of state. She had great influence with Constantine, for whose advancement she was willing to make almost any sacrifice. It is said that she reported to him a plot in which her father, Maximianus, was concerned, thereby causing Constantine to order the execution of Maximianus. She met her death by suffocation in a heated bath, at Constantine's order. This action is variously stated as being due to a discovery of her infidelity, or at anger upon finding the falsity of statements made by her which had led him to put to death Crispus, his son by a former wife. She was the mother of the subsequent emperors Constantinus II, Constantius II, and Constans. Consult *The Cambridge Mediæval History*, vol. i (New York, 1911).

FAUSTIN I, fō'stăN' (1785–1867). An emperor of Haiti, known before his elevation to the throne as Faustin Soulouque. He was a negro and was born in very humble circumstances at Petit Goave in Haiti. In his youth he acted as a servant and later as adjutant to General Lamarre and took part in the negro insurrection of 1803. He subsequently served under Presidents Pétion and Boyer and was raised by the latter to the rank of captain. After the year 1844, when the Haitian Republic was dissolved by the rebellion of the eastern part of the island, which established the Republic of Santo Domingo, a struggle for the supreme power ensued, in which Faustin, as Governor of Port-au-Prince and commander of the Presidential Guard, played an important part. In 1847 he was appointed President of the Republic by the Senate, which hoped to find a pliable tool in him; but he speedily began to follow his own inclinations. He was an implacable enemy of the mulattoes, and on April 16, 1848, a massacre of the mulatto population in Port-au-Prince took place at his instigation. In August, 1849, he caused himself to be proclaimed Emperor, a title which he held for about 10 years. Between 1849 and 1857 he made four attempts to conquer Santo Domingo, but failed. His reign was marked by oppression and cruelty; he plundered the country to meet the expenditures of his court, which he conducted in apish imitation of that of Napoleon III. A revolution, headed by General Geffrard, broke out in 1858, and a republic was declared. Faustin was forced to abdicate in January, 1859, but was allowed to live and sent off to Jamaica. He returned to Haiti shortly before his death, which occurred on Aug. 6, 1867.

FAUSTI'NA. The name of two Roman empresses, mother and daughter. The former, ANNIA GALERIA FAUSTINA, usually spoken of as SENIOR, was the wife of the Roman Emperor Antoninus Pius, and died 141 A.D. (or perhaps, 140). (See ANTONINUS; FAUSTINA, TEMPLE OF.)—FAUSTINA JUNIOR, daughter of the foregoing and Antoninus Pius, was married to his successor, Marcus Aurelius Antoninus, and died at a village near Mount Taurus in 175 A.D. Both, but particularly the younger, are described by the Roman historians as notorious for the profligacy of their lives, which their exemplary husbands in vain endeavored to check. The younger Faustina was heartily beloved by Marcus Aurelius; hence some have questioned the judgment of the historians. After their deaths institutions for the relief of poor girls were founded both by Antoninus and Marcus Aurelius in honor of them and were called "*Puellæ Alimentariæ Faustinianæ.*"

FAUSTMANN, foust′mȧn, Martin (1822–76). A German forester, born at Giessen and educated at the same place, studying theology first and then forestry. He invented an instrument for measuring the height of trees and made valuable studies in the problems of forest valuation—a subject which is discussed in his work, "Berechnung des Wertes, welchen Waldboden sowie noch nicht haubare Holzbestände für die Waldwirtschaft besitzen," published in the *Allgemeine Forsts- und Jagdzeitung* (Frankfort, 1849).

FAUS′TULUS. The legendary shepherd who discovered the abandoned infants Romulus and Remus and took them to his house, where they were brought up by his wife, Acca Larentia. His hut was shown on the Palatine.

FAUSTUS OF RIEZ, rē′ĕz′. A Semi-Pelagian of southern France, who lived during the fifth century. The place of his birth is disputed, and the precise dates of both his birth (405–410) and death (490–495) are unknown. He entered the monastery at Lerinum (Lerins), where he was afterward (about 432) made abbot. Here he was vigorous in defending the rights of the monastery against the Diocesan Bishop of Fréjus. After some 25 years of service as abbot, Faustus was made Bishop of Regium (Riez) in Provence, which office he held until his death. During about four years of this time (c.481–485) he suffered exile, probably on account of his strictly orthodox Trinitarian doctrine, which offended the (Arian) West-Gothic King, Eurich. Faustus opposed all Arianism and other Eastern heresies, e.g., Macedonianism and Nestorianism; but judged by Augustinian standards, he fell into error in his views respecting free will and divine grace. He belongs to that large class of fifth-century churchmen who are called Semi-Pelagians, though perhaps Semi-Augustinians would be a more accurate designation. (See Semi-Pelagianism.) He held peculiar views regarding the soul, apparently teaching its corporeality.

Among Faustus's writings are letters, dogmatic and ethical treatises, and homilies. Two of his homilies on the Creed (wrongly attributed in the manuscripts of Eusebius of Emesa) are of special value. His interest in the ascetic life is illustrated by his six *Sermones ad Monachos*. His chief work, entitled *On the Grace of God*, exhibits the Semi-Pelagian side of his teaching. An incomplete edition of Faustus's works may be found in Migne, *Patrol. Lat.*, lvii; a better edition is that by Engelbrecht, in *Corpus Scriptorum Eccles. Lat.*, xxi (Vienna, 1891). Consult: Koch, *Der heilige Faustus* (Stuttgart, 1895); Worter, *Zur Dogmageschichte des Semipelagianismus* (Münster, 1900); Harnack, *History of Dogma*, vol. v (Eng. trans., Boston, 1899).

FAUVEL, fō′vĕl′, Sulpice Antoine (1813–84). A French physician. He was born and educated in Paris, and subsequently went to Turkey, where he became a member of the Sanitary Council at Constantinople (1848). Shortly after his return to Paris in 1866, he was appointed inspector general of the Sanitary Department of the French government. His works on the Oriental plague, the cholera, which he had closely studied during his long residence in the East, and typhus were extremely valuable and had much influence on the quarantine regulations of numerous governments. His works include: *Le choléra, étiologie et prophylaxie* (1868); *Rapports sur l'organisation du service des quarantaines en Turquie* (1873); *Règlement général de police sanitaire maritime* (1876).

FAUVELET, fō′vlȧ′, Jean Baptiste (1810–90). A French genre and still-life painter. He was born at Bordeaux and studied under Delacour, but was a follower of Meissonier. His paintings are very small, of delicate and harmonious color, and highly finished, but without being hard. Among his pictures are: "A Young Man Reading" (1845); "The Two Roses" (1847); "The Carver" (1850); "The Prodigal Son" (1869); "Ascanio" (Luxembourg Museum); "Pheasants" (Wallace collection, London); "Rigolo" (Chartres Museum).

FAVARA, fȧ-vä′rȧ. A city of Girgenti, Sicily, 1066 feet above sea level, 6 miles east of Girgenti and 9 miles from the Mediterranean (Map: Italy, D 6). It mines sulphur, alum, and tourmaline, quarries marble, markets fruit, and has a castle of the Chiaramonte family, who in the fourteenth century were politically important. Pop. (commune), 1901, 20,398; 1911, 21,599.

FAVARO, fȧ-vä′rō, Antonio (1847–). An Italian mathematician, born in Padua and educated in that city and at Turin and Zurich. In 1872 he was appointed professor of graphic statics at Padua and in 1878 opened a course on the history of mathematics at that university. In 1879 he began to devote himself more particularly to the study of Galileo and in 1887 was intrusted with the preparation of a national edition of Galileo's works. He prepared more than 200 memoirs and other writings, a large number of which are devoted to the study of Galileo. Among these are: *La statica grafica nell' insegnamento tecnico superiore* (1873); *Lezioni di statica grafica* (2d ed., 1877); *Miscellanea Galileiana inedita* (1887); *Nuovi studi Galileiani* (1891); *Trent anni di studi Galileiani* (1907); *Atti della nazione germanica artista nello Studio di Padova* (1911–12).

FAVART, fȧ′vär′, Charles Simon (1710–92). A very prolific French dramatist and theatrical manager, at one time director of the Opéra Comique. He wrote, largely in collaboration with his wife, some 150 comedies and operettas, of which the more noted are: *La chercheuse d'esprit* (1741); *Les amours de Bastien et de Bastienne*, a parody on *Le devin du village;* and *Les trois sultanes*. His works are published in 10 vols. (Paris, 1763–72); a selection of them in 3 vols. (1813). His *Mémoires et correspondance littéraires* (Paris, 1808) is very valuable for the history of the French drama. Consult Font, *Favart, L'opéra comique, et la comédie-vaudeville aux XVIIe et XVIIIe siècles* (Paris, 1894). His wife, Marie Justine Benoîte Duronceray (1727–72), was a most distinguished comédienne, singer, and dancer. She was the first French actress to appear in real peasant's garb, when playing a peasant character. It was her popularity and influence that made possible the successful introduction of Italian light opera in France.

FAVENTIA. See Faenza.

FAVERSHAM, făv′ĕr-sham. A municipal

borough, market town, and seaport of Kent, England, and a member of the Cinque Port of Dover, on a navigable arm of the Swale, opposite Sheppey Island, 9 miles west-northwest of Canterbury (Map: England, G 5). Its parish church is a handsome early-English structure, with curious carvings and a fine spire. Of the Cluniac Abbey, founded by King Stephen, in which he, his wife, and son were buried, there are but slight remains. It has valuable oyster fisheries and carries on a large trade in fruit and hops. There is also a considerable industry in shipbuilding and in the making of bricks and cement. It sends much agricultural produce to London. In the vicinity are large guncotton and powder factories. Gas and water are supplied by private companies, but the town owns its electric-lighting plant. Pop., 1901, 11,290; 1911, 10,619. Under the name of Faversfield it was a seat of the Saxon kings. Its earliest existing charter dates from the reign of Henry III. Here James II was arrested and sent back to London after his first attempt to escape to France.

FAV'ERSHAM, făv'ẽr-sham, WILLIAM (1868–). An American actor, born and educated in England. In 1888 he came to the United States and in 1893 joined the Empire Theatre Company, of which he became leading man in 1896, appearing in a number of successful plays. He left the Empire Company in 1901 and made his début as a star as Don Cæsar in *A Royal Rival*. In 1908 he appeared in New York under his own management in *The World and his Wife*, an adaptation of Echegaray's *El Gran Galeoto*. The following year he produced Stephen Phillips's *Herod*, appearing in the title rôle. In 1912 and 1914 he presented productions of *Julius Cæsar* and *Othello*, playing in the former Anthony and in the latter Iago. Consult William Winter, *The Wallet of Time* (2 vols., New York, 1913).

FAVIGNANA, fä'vē-nyä'nȧ. The chief of the Ægadian Islands (q.v.), lying about 6 miles off the west coast of Sicily, and about 6 miles long and about 2 miles wide (Map: Italy, D 6). Area, 7½ square miles. The chief town of the same name, situated on the north side, has a good harbor and is defended by three forts. A colony of convicts is kept at Favignana. Pop. of island, 1901, 6414; 1911, 6079; the most important industry is fishing. Many caves exist on the island, and in some of them have been found ancient weapons and utensils.

FAVO'NIUS, MARCUS (?90–42 B.C.). A Roman politician, nicknamed "Cato's Ape," on account of his servile imitation of the latter's character and conduct. He was a partisan of the Optimates, and opposed all the measures of the first triumvirate. Notwithstanding his personal aversion to Pompey, he fought with him during the Civil War, but upon Pompey's death was pardoned by Cæsar. He took no part in the conspiracy against Cæsar, but after his murder espoused the cause of Brutus and Cassius. He was put to death by Octavius after the battle of Philippi.

FAV'ORI'NUS. A sophist and skeptical philosopher of the time of Hadrian. He was a native of Arelate (Arles) in Gaul, but for many years was a traveler in Greece and in the East. He was on intimate terms with Plutarch, Herodes Atticus, Demetrius of Alexandria, Cornelius Fronto, Aulus Gellius, and with the Emperor Hadrian himself. He wrote: *Pantodape Historia* (Miscellaneous History), in 24 books, which dealt, at least in part, with the history of philosophy (used by Diogenes Laertios and Stephanus of Byzantium); *Apomnemoneumata* (Memoirs); a work on the rearing of children, *Peri Paidon Trophes; Pyrroneioi Tropoi* (Pyrrhonean Tropes), in 10 books, an attempted application of the methods of Pyrrho (q.v.) to practice in the law courts. Only a few fragments of his works have been preserved. His conversations are described at some length by his devoted admirer, Gellius, in the *Noctes Atticæ*. Consult: Goedeckemeyer, *Die Geschichte der griechischen Skeptizismus* (Leipzig, 1905); Gabrielsson, *Ueber Favorinus und seine Παντοδαπὴ Ἱστορία* (Leipzig, 1906); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii (5th ed., Munich, 1913); Schick, *Favorin Περὶ Παίδων Τροφῆς und die antike Erziehungslehre* (Leipzig, 1912).

FAVORITA (fä'vō-rē'tȧ), LA (It., the favorite). An opera by Donizetti (q.v.), first produced in Paris, Dec. 2, 1840; in the United States in 1848.

FAVOSITES, făv'ō-sī'tēz. The most important genus of fossil tabulate corals, characterized by the vertical rows of round pores that perforate the walls of the individual polygonal cells. The animals of this coral formed colonies of rounded or branching form, and in the Silurian and Devonian periods they were important coral-reef builders. Silicified specimens of *Favosites* and its near ally, *Michelinia*, are often found lying loose in the residual soils of Silurian and Devonian regions and are then known to the farmers of the vicinity as "fossil bees' nests." The best-known species are *Favosites niagarensis* and *Favosites gothlandicus*, of the Silurian, and *Favosites polymorpha*, of the Devonian. See Plate of CORALS.

FAVRAS, fȧ'vrȧ', THOMAS DE MAHY, MARQUIS DE (1744–90). A French general, born at Blois. He entered the French army, and in 1772 became first lieutenant in the Swiss Bodyguards of the Count of Provence (afterward Louis XVIII). In 1787 he organized and commanded a legion of émigrés in Holland. Two years later he was accused of conspiracy with the Comte de la Châtre to secure the escape from Paris of the King and was condemned to death and executed. Consult the memoir (Vienna, 1881) by Freiherr von Stillfried Ratenic, a descendant of Favras's daughter, and the elaborate article by Monin in *La grande encyclopédie*.

FAVRE, fȧ'vr', ALPHONSE (1815–90). A Swiss geologist. He was born at Geneva, studied at the academy there, and was appointed professor of geology in the academy. He was a correspondent of the French Institute. His researches regarding the geology of the Alpine regions gained for him a prominent place in the list of scientists who have devoted themselves to the investigations of mountain structure. His experimental work on the folding of rocks also commanded wide attention. His more important works include: *Sur la structure en éventail du Mont Blanc* (1865) and *Recherches géologiques dans les parties de la Savoie, du Piémont et de la Suisse voisines du Mont Blanc* (3 vols., 1867).

FAVRE, JULES CLAUDE GABRIEL (1809–80). A French advocate, author, and politician. He was born at Lyons, March 21, 1809, and studied for the bar at Paris, where he took an active part in the July revolution of 1830. On returning to Lyons, the same year, he became noted for his ardent republicanism. In 1834 he defended the cause of workingmen accused of illegal association and identified himself with radical causes. He developed a wonderful oratorical style and became a prominent lawyer in Paris after 1835, but still found time for literary work. After the February revolution of 1848 he was Secretary in the Ministry of the Interior, in which capacity he inspired a circular demanding that the commissioners of the Republic be invested with dictatorial authority in the provinces. He was also active as a member of the Committee of Foreign Affairs. After the election of December 10 Favre showed himself a persistent antagonist of Louis Napoleon and after the flight of Ledru-Rollin became the orator of the radical Republicans. He was an ardent Republican but a Liberal of the older type with a leaning to the Right and no sympathy with Socialism. In questions of taxation, freedom of the press, and the death penalty he voted with the Left. The coup d'état of Dec. 2, 1851, closed his political career for the time. In 1858 he defended Orsini, who had attempted to murder Napoleon III. In the same year he became a member of the Corps Législatif, and a leader of the small group whose persevering opposition to the Empire promoted the revival of Republican opinion that finally submerged it. He gradually gave place in popularity to younger Republican leaders like Rochefort and Gambetta. In his discourse on entering the French Academy in 1868, he appeared as a spiritualist and an antiradical. In 1868 he founded the Republican journal *L'Electeur*, and he opposed with all his power the policy which led to the breach with Prussia. After Sedan, Favre called for the deposition of the Emperor and the formation of a Government of National Defense. He was chosen Vice President and became Minister of Foreign Affairs and carried on negotiations with Count Bismarck, but was less successful as a practical administrator than he had been as a polemist and orator. When Thiers became Chief of the Executive, he appointed Favre Minister of Foreign Affairs, and as such he signed the definitive Treaty of Paris at Frankfort, May 10, 1871. He resigned office in July, 1871, and resumed his law practice. Favre was a voluminous writer on social and political subjects. He died at Versailles, Jan. 19, 1880. Among his works may be mentioned: *Rome et la république française* (1871); *Le gouvernement du 4 Septembre* (1871–72); *Conférences et mélanges* (1880–82). Consult: Maritain, *Jules Favre, mélanges politiques* (Paris, 1882); King, *French Political Leaders* (New York, 1882); Benoit-Lévy, *Jules Favre* (Paris, 1884); G. Hanotaux, *Histoire de la France contemporaine* (ib., 1903).

FAVRE, Louis (1826–79). A French engineer and contractor. He was born at Chêne-Bourg, near Geneva, and studied railroad engineering in France. He displayed great engineering skill at Lyons and elsewhere, and in 1872 was awarded the contract for the construction of the St. Gotthard Tunnel within the space of eight years.

The severe competition for the contract appears to have caused bad feeling against Favre, who subsequently encountered not only unexpected difficulties in construction, but also, it is said, the opposition of the chief engineer of the tunnel. Favre conducted the work with ability up to the time of his death, and it was completed not long after the expiration of the contract period. Contentions over the responsibilities for this delay and other financial claims on both sides resulted in litigation which extended until 1885. The executors appear to have got the best of the litigation, although, according to the London *Contract Journal* (article reprinted, *Engineering News*, July 11, 1885), Favre lost his fortune before his death, and the sum recovered by his executors was not adequate compensation for the work done.

FA'VUS (Lat., honeycomb, *Tinea favosa*, crusted ringworm). A disease of the skin, chiefly of the scalp, characterized by yellowish, dry incrustations of more or less roundish form, and often cup-shaped, composed of the sporules and mycelia (q.v.) of a vegetable growth, the *Achorion schönleinii*. The disks of favus are produced with great rapidity and spread rapidly, if not attended to at the first, over the whole scalp, destroying the bulbs of the hair, which becomes very short and thin and then falls out altogether. Favus spreads only where cleanliness is greatly neglected and is therefore almost unknown among the better classes. It is very rare in the United States and in England; common in Hungary, Russia, Italy, France, and Scotland. It is far more common among children than among adults. It may occur on the nonhairy parts of the body and also on the nails. In treating favus the fungus must be removed with the point of a knife from the free surface of the skin or the nails, and mercurial ointment should be rubbed in. If on the scalp, the cure is attempted by a variety of ointments and lotions, principally consisting of sulphur or mercury, and by pulling out the hair by the roots, or "epilation." In inveterate cases long persistence in habits of the most scrupulous cleanliness is essential, and therefore the cure is seldom permanent, though easily attained for the time. X-ray treatment has been successful in many cases. Favus is almost always followed by permanent baldness of the part affected, unlike ringworm (q.v.), which disease it somewhat resembles.

FAW'CETT, Edgar (1847–1904). An American poet and novelist, born in New York, May 26, 1847. He was graduated at Columbia University in 1867. From an early age he was a voluminous contributor to journals and a popular writer of poetry, drama, and fiction. Among his very numerous volumes are: *Short Poems for Short People* (1871); *Purple and Fine Linen*, a novel (1873); *Poems of Phantasy and Passion* (1878); *A Hopeless Case* (1880); *The False Friend*, a successful play (1880); *The New King Arthur: a Dramatic Poem* (1884); *Song and Story* (1884), poems; *Romance and Reverie: Poems* (1886); *Songs of Doubt and Dream*, collections of verse; and the novels *Fair Fame* (1894), *Outrageous Fortune* (1894), and *The Ghost of Guy Thyrle* (1897). He also published *Agnosticism and Other Essays* (1889).

FAWCETT, Henry (1833–84). An English economist, born at Salisbury. He was educated at Trinity Hall, Cambridge, of which he was a scholar; graduated with high mathematical honors in 1856, and was elected a fellow in the same year. Mr. Fawcett was totally deprived of his sight in 1858 by an accident when shooting. Having written and published *A Manual* *of Political Economy* (1863), the *Economic Position of the British Laborer* (1865), and having been an extensive contributor of articles on economic and political science to various magazines and reviews, he was elected, in 1863, professor of political economy in the University of Cambridge. He unsuccessfully contested for a parliamentary seat, on Liberal principles, Southwark, in 1857; the borough of Cambridge in 1862; and Brighton in February, 1864; but he was returned for the last-named constituency in 1865 and was reëlected in 1868. He was unseated at Brighton at the general election of February, 1874, and was elected for Hackney in April of the same year. In 1880 he became Postmaster-General and conducted the affairs of his office with great zeal and energy. He published, besides his manual, *Pauperism: Its Causes and Remedies* (1871); *Speeches on Some Current Political Questions* (1873); *Free Trade and Protection* (1878); etc. In his economic writings Professor Fawcett was an uncompromising advocate of free trade and the individualistic economic doctrines with which that policy is associated; in politics he was a Liberal. Consult Leslie Stephen, *Life of Henry Fawcett* (5th ed., London, 1886).

FAWCETT, MILLICENT GARRETT (1847–). An English writer, born at Aldeburgh, Suffolk. In 1867 she married Prof. Henry Fawcett, the political economist, and soon afterward she began to take an interest in the woman's suffrage movement, becoming eventually president of the National Union of Women's Suffrage Societies. St. Andrew's University conferred upon her the degree of LL.D. She published among other books: *Political Economy for Beginners* (1870); *Essays and Lectures*, with her husband (1872); *Tales in Political Economy* (1875); *Janet Doncaster*, a novel (1875); a *Life of Her Majesty, Queen Victoria* (1895); *Five Famous French Women* (1906); *Women's Suffrage* (1912).

FAWKES, fạks, GUY, or GUIDO (1570–1606). An English conspirator. The son of Edward Fawkes, a Protestant ecclesiastical proctor and notary, he was born in York. Under a stepfather's influence he became a Roman Catholic, and, after coming into possession and disposing of his father's property, he enlisted as a soldier of fortune in the Spanish army, serving in Flanders. He returned to England on the accession of James I (James VI of Scotland) and became associated with Catesby and other conspirators, who hoped to restore Roman Catholicism by blowing up the King, his Ministers, Lords, and Commons, at the assembling of the Houses of Parliament on Nov. 5, 1605. Fawkes was chosen to be the chief agent in the deed, and when he was arrested all arrangements had been made for applying the fuse to the train leading to barrels of gunpowder which had been stored in a cellar of the Houses of Parliament. Though he at first refused to divulge the names of his companions, he finally succumbed to torture and confessed. He and six of his accomplices were brought to trial before a special commission Jan. 27, 1606; and, four days later, he and three accomplices were hanged and quartered. Parliament set apart November 5 forever as a day of thanksgiving. The commemoration of the event, although fast dying out, still prevails, especially in cathedral towns, where grotesque effigies called "Guy Fawkes," or "Guys," with high cap and lantern, after being carried in procession through the streets by fantastically garbed and masked attendants, are committed to the flames of huge bonfires. (See GUNPOWDER PLOT.) Consult: *A True and Perfect Relation* (London, 1606), reprinted, with new materials, as *The Gunpowder Treason* (ib., 1679); Howell, *State Trials* (34 vols., ib., 1809–28); Winwood, *Memorials* (3 vols., ib., 1725); *The Fawkes of York in the Sixteenth Century* (ib., 1850); Gardiner, *What the Gunpowder Plot Was* (ib., 1897); id., *History of England* (ib., 1893–95); and Hazlitt's articles justifying Fawkes, in the November *Examiner* (ib., 1821).

FAWNIA, fą'nĭ-ȧ. The lady love of Dorastus, in Robert Greene's *Pandosto* (or *Dorastus and Fawnia*). The character suggested the Perdita of Shakespeare's *Winter's Tale*.

FAX'WAX, or **PAX'WAX**. The ligament sustaining the weight of the head. See LIGAMENT.

FÁY, fī, ANDRÁS (1786–1864). An Hungarian author, born at Kohány, County of Zemplén. He studied philosophy and law at the Protestant College of Sárospatak, was called to the bar, and for a time held an official position at Budapest. Ill health, however, soon led him to resign, and he henceforth devoted his life to literary pursuits and to the cause of national progress. After two volumes of poems appeared a collection of fables, *Mesék* (1820), which first brought him into prominence. Some of his fables have been translated into English by E. D. Butler (*Hungarian Poems and Fables*, London, 1877). His other writings include a tragedy, *A két Báthory* (The Two Báthorys) (1827); several comedies, the best of which is *Régi Pénzek* (Ancient Coins); the first attempt at an Hungarian society novel, *A Bélteky ház* (The House of the Béltekys) (1832); and a humorous novel, *Jávor orvos és Bakator Ambrus szolgája* (Doctor Jávor and his Servant Ambrose Bakator) (1855). In 1835 he was elected to the Hungarian Diet. Fáy was a constant contributor to literary and scientific periodicals upon important social questions and contributed largely to the accomplishment of many important reforms, such as the establishment of a national theatre at Budapest and the introduction of life insurance and of savings banks into Hungary. Since his death the Budapest savings banks have established a fund in his memory, the income of which is awarded each year to the most notable literary production of the year, exclusive of belles-lettres. Fáy's collected works are contained in 8 vols. (Budapest, 1843–44); his novels in a more recent edition (3 vols., ib., 1883). For his biography, consult Badics (Budapest, 1890) and Erdélyi (ib., 1890).

FAY, fā, CHARLES ALEXANDRE (1827–). A French general and military writer. He was born at Saint-Jean-Pied-de-Port and was educated at Saint-Cyr and at the school for the general staff. He was engaged in the topographical work in the Pyrenees, served in Africa, and had his horse shot under him at the battle of Laghouat (1852). During the Crimean War he was aid-de-camp to General Bosquet and fought brilliantly at the Alma and Inkerman. Upon the outbreak of the Franco-German War, in 1870, he was appointed lieutenant colonel on the staff of Marshal Bazaine and was taken prisoner at the capitulation of Metz. In 1874 he was charged with the organization of the bureau of the general staff and appointed brigadier general. On Feb. 1, 1890, he was appointed commander of the Eleventh Army Corps and was retired in 1892. He wrote: *Souvenirs de la guerre de Crimée* (1867); *Etude sur la guerre d'Allemagne en 1866* (1867); *De la loi militaire* (1870); *Journal d'un officier de l'armée du Rhin* (1871; 5th ed., 1890); *Etude de marches: Jéna, Sedan* (1899).

FAY, Charles Ernest (1846–). An American linguist and Alpinist, born at Roxbury, Mass. He graduated in 1868 at Tufts College and became instructor in mathematics there in 1868, in modern languages in 1869, and professor of modern languages in 1871. In 1883 he assisted in founding the Modern Language Association, of whose pedagogical section he was president in 1890, and he was president of the New England Association of Colleges and Preparatory Schools in 1888–89 and of the New England Modern Language Association in 1905. He is author of various monographs and articles on modern-language subjects. A pioneer in the development of mountaineering in the Canadian Rockies and the Selkirks, he served as president of the Appalachian Mountain Club in 1878, 1881, 1893, and 1905, and as first president of the American Alpine Club (1902–08); has been elected honorary member of several foreign Alpine clubs; since 1879 has edited *Appalachia*, and since 1907 *Alpina Americana*, the second number of which is his monograph on "the Rocky Mountains of Canada." A contributor to the New International Encyclopædia.

FAY, Edwin Whitefield (1865–1920). An American classical scholar and educator. He was born at Minden, La., and was educated at the Southwestern Presbyterian University (A.M., 1883) and at Johns Hopkins University (Ph.D., 1890). He also studied at Leipzig. In 1890–91 he was instructor in Sanskrit at the University of Michigan and in 1893–99 held the professorship of Latin at Washington and Lee University. At the University of Texas he was acting associate professor in 1892–93 and after 1899 professor of Latin. Besides essays on Sanskrit and contributions on philology, he published: *The History of Education in Louisiana* (1898); *The Mostellaria of Plautus* (1902); *Culture in Education* (1912).

FAY, Theodore Sedgwick (1807–98). An American poet, essayist, and story-writer, born in New York City. He studied law, but never practiced, and in 1828 became associate editor of the New York *Mirror*, for which he wrote during extended travels in Europe. He was Secretary of the American Legation in Berlin (1837–53), then Minister Resident in Bern, Switzerland (1853–61), and lived for some years in Berlin. Among his books are: *Dreams and Reveries of a Quiet Man* (1832); *Norman Leslie*, a tale, long popular, of New York, afterward dramatized (1835); *Sydney Clifton* (1839); *Countess Ida* (1840); *Hoboken*, a romance (1843); and *Robert Rueful* (1844). To poetry he contributed *Ulric, or the Voices* (1851); to theology, *Views of Christianity* (1856); to history, *Switzerland* (1860) and *History of the Three Germanys* (1889); to education, *Great Outlines of Geography* (1867) and *First Steps in Geography* (1873).

FAYAL, fī-äl′ (Portug., place planted with beech trees; so called on account of some trees mistaken for beeches by the early European colonists of the island). One of the Azores (q.v.), in lat. 38° 25′ N., and long. 28° 35′ W., situated a little to the west of the island of Pico (Map: Portugal, A 4). It is about 10 miles long; area, 64 square miles. It has a mountainous surface, rising to an altitude of over 3300 feet. Its soil is fertile, producing grain, oranges, potatoes, and onions. There is a scarcity of water and wood. The salubrious climate attracts many visitors. The island has in former times suffered from volcanic outbreaks. Fayal has a population of 22,385. Its chief port is Horta (pop., 6734), where the German submarine cable from Borkum to New York has a station.

FAYE, fȧ, Hervé Auguste Etienne Albans (1814–1902). A French astronomer. He was born at Saint-Benoît-du-Sault (Indre) and was educated at the Ecole Polytechnique, which he left in 1834, before completing his course, to accept a position in the observatory at Paris to which he had been appointed on the recommendation of M. Arago. He made rapid progress in his astronomical studies and investigations, and on Nov. 22, 1843, attracted world-wide attention by the discovery of the periodical comet which bears his name. This discovery won him the Lalande prize and a membership in the Academy of Sciences. In 1848 he became an instructor in geodesy at the Polytechnique, and in 1854 rector of the academy at Nancy and professor of astronomy in the faculty of science there. He was inspector general of secondary education from 1857 to 1862 and was appointed professor of astronomy and geodesy at the Ecole Polytechnique in 1873. He served as president of the Bureau of Longitudes in 1876 and chief inspector of higher education in 1877, and in the latter year for a short time was Minister of Public Instruction in the Rochebouet cabinet. His work covers the entire field of astronomical investigation. It comprises the determination of comet periods, the measurement of parallaxes, and the study of stellar and planetary movements. He advanced several original theories on the nature and form of comets, meteors, the aurora borealis, and the physical constitution of the sun. In collaboration with Charles Galusky he translated Humboldt's *Cosmos* (4 vols., 1846–59), and, in addition to numerous contributions to scientific periodicals, published the following important works: *Sur les déclinaisons absolues* (1850); *Leçons de cosmographie* (1852; 2d ed., 1854); *Sur les cyclones solaires* (1873); *Cours d'astronomie de l'Ecole Polytechnique* (2 vols., 1881–83); *Sur l'origine du monde* (1884; 3d ed., enlarged, 1895); *Nouvelle étude sur les tempêtes, cyclones, trombes, ou tornados* (1897). See Faye's Comet.

FAYERWEATHER, fâr′wĕth-ẽr, Daniel B. (1821–90). An American merchant and philanthropist, born at Stepney, Conn. He accumulated a fortune as a leather dealer in New York City. He made special bequests to charitable and educational institutions, aggregating more than $2,000,000, and directed that about $3,000,000 more should be placed with three executors for similar distribution. His will was subjected to a remarkable and prolonged contest, which resulted in a complete victory for the beneficiaries.

FAYE'S COMET. A comet discovered at Paris by Faye, Nov. 22, 1843. It is one of the periodic comets, whose return has been observed several times; viz., in the years 1851, 1858, 1865, 1873, 1880, 1888, 1895, and 1910. See Comets.

FAYETTE, fā-ĕt′. A town in Fayette Co., Iowa, 128 miles northwest of Davenport, on the Chicago, Milwaukee, and St. Paul Railroad (Map: Iowa, F 2). Upper Iowa University (Methodist Episcopal), founded in 1857, is situated here, and the town contains a Carnegie library. Fayette has a creamery and agricultural interests. Settled in 1856, it was incorporated as a town in 1874 under a general State law. The water works and electric-light plant are municipally owned. Pop., 1900, 1315; 1910, 1112.

FAYETTE. A city and the county seat of Howard Co., Mo., 135 miles (direct) west by north of St. Louis, on the Missouri, Kansas, and Texas Railroad (Map: Missouri, D 2). The Howard Payne College for Women (Methodist Episcopal, South), opened in 1844, and the Central College (Methodist Episcopal, South), opened in 1857, are situated here, and the city contains a Carnegie library. Fayette has flouring mills and agricultural interests. It owns its water works and lighting plant. Pop., 1900, 2717; 1910, 2586.

FAYETTEVILLE, fā-ĕt′vĭl. A city and the county seat of Washington Co., Ark., 63 miles north by east of Fort Smith, on the St. Louis and San Francisco and the Kansas City and Memphis railroads (Map: Arkansas, A 1). It is a popular summer resort, noted for its picturesque situation and mineral wells, and is the seat of the University of Arkansas. A national cemetery, containing 1236 graves, 782 of unknown dead, and a Confederate cemetery, in the centre of which stands a handsome monument, are situated here. The city contains also a hospital, county jail, and a courthouse. Fayetteville has manufactures of lumber, flour, wagons, foundry products, etc., and a trade in live stock, grain, fruit, and agricultural produce. The water works are owned by the municipality. Pop., 1900, 4061; 1910, 4471.

FAYETTEVILLE. A city and the county seat of Cumberland Co., N. C., 60 miles south by west of Raleigh, on the Cape Fear River, at the head of navigation, and on the Aberdeen and Rockfish, the Norfolk Southern, and the Atlantic Coast Line systems (Map: North Carolina, D 2). The State Colored Normal School and the Donaldson-Davidson Academy are situated here, and there are hospitals, a military school, and an Elks Home. The city is in a fertile agricultural region, carries on a trade in cotton and naval stores, and has extensive manufactures of cotton, silk, cottonseed oil, lumber, furniture, flour, woodenware, tools, etc. There is also a large vineyard. Manufacturing has been greatly enhanced by the development of electrical power from the Buckhorn Rapids above the city, and the canalization of the Cape Fear River from Fayetteville to Wilmington, insuring a depth of 8 feet. The city government, under a charter of 1893, is vested in a mayor, chosen annually, and a municipal council, elected on a general ticket. It owns the water works and electric-light plant. Pop., 1900, 4670; 1910, 7045.

Settled by the Scotch in 1736 and laid out as Campbellton in 1762, Fayetteville received its present name during a visit of Lafayette in 1784 and was incorporated as a city in 1893. In 1831 it was almost completely destroyed by fire. On April 22, 1861, Governor Ellis of North Carolina seized the United States arsenal here, containing a number of cannon, a large quantity of ammunition, and 35,000 small arms. In 1865 General Sherman's forces occupied the village, destroying the arsenal and considerable property.

FAYETTEVILLE. A town and the county seat of Lincoln Co., Tenn., 75 miles south of Nashville, on the Elk River, and on the Nashville, Chattanooga, and St. Louis Railroad (Map: Tennessee, D 4). It contains the Morgan Training School, high schools, and a public library. It is the centre of a fertile agricultural district, producing corn, cotton, wheat, tobacco, fruits, and live stock. There are lumber, cotton, and flour mills and an ice factory. The water works are owned by the municipality. Pop., 1900, 2708; 1910, 3439. Andrew Jackson encamped here on Oct. 7, 1813, when he was campaigning against the Creek Indians.

FAYOLLE, GENERAL (French commander). For his biography see VOLUME XXIV.

FAY′RER, SIR JOSEPH (1824–1907). An English physician. He was born at Plymouth and was educated at London, Edinburgh, and on the Continent. Entering the medical service of the navy, he served on H. M. S. *Victory* and later in the military hospital at Palermo during the siege of 1849. He acted as assistant surgeon in the Bengal Medical Service from 1850 to 1874, served in the Burmese War of 1852 and in the Indian Mutiny of 1857, and was residency surgeon during the siege of Lucknow. From 1859 to 1874 he was professor of surgery at the Medical College of Bengal and was successively president and vice president of the Bengal Asiatic Society. He was appointed surgeon-general and president of the India Office in December, 1874, and in 1901 became physician extraordinary to King Edward VII. His principal works are the following: *Clinical Surgery in India* (1866); *The Thanatophidia of India* (1872), a work on the poisonous snakes; *Lettsomian Lectures on Fever and Dysentery in India* (1881); *On the Preservation of Health in India* (1898); *Recollections of my Life* (1900).

FAYUM, fī′o͞om′, THE (Coptic *phiom*, sea, lake). An Egyptian province west of the Nile, in the Libyan Desert. It contains 670 square miles, had a population (1907) of 441,583, and is as celebrated for its fertility and productiveness to-day as it was in antiquity. Fruits of all kinds grow in abundance, and it is the only part of Egypt where the olive attains perfection. Its chief products are cotton and cereals. The greater part of the district originally formed the bed of Lake Mœris (q.v.), but great embankments constructed by the kings of the twelfth dynasty, especially by Amenemhat III (q.v.), reclaimed a large amount of land, and a considerable area was also diked off under the second Ptolemy. The modern representative of Lake Mœris is the Birket el-Kerun, or 'Lake of Horns' (so called from its shape), some 34 miles long by 4½ miles wide, which extends along the western and northern sides of the province. The Fayum is watered by the Bahr Yusuf (Joseph's Canal), a channel which diverges from the Nile to the north of Siut, enters the Fayum through a narrow opening in the Libian chain, and then divides into numerous ramifications. From very ancient times the district was the seat of worship of the crocodile-headed god Sobk (q.v.), and its chief town was called by the Greeks Crocodilopolis. Ptolemy II Philadelphus established a colony of veterans in the district which he renamed the Arsinoite nome, and its capital, the old Crocodilopolis, was later called Arsinoë. It is now called Medinet el-

Fayum; pop., 1897, 31,262. Consult: Petrie, *Hawara, Biahmu, and Arsinoë* (London, 1889); R. H. Brown, *The Fayûm and Lake Mœris* (ib., 1892); Sir William Willcocks, *The Assuân Reservoir and Lake Mœris* (ib., 1904); Bradwell, *The Topography and Geology of the Fayum Provinces of Egypt* (Cairo, 1905).

FAZIO, fä'tsē-ō. A tragedy by Dean Milman, published in London, 1815. The rôle of Bianca was a favorite with Fanny Kemble and Madame Ristori.

FAZY, fȧ'zē' (JEAN) JAMES (1794–1878). A Swiss statesman and author, born in Geneva and educated in Paris, where he began the study of political economy. When the Carbonari (q.v.) spread to France in 1820, he became affiliated with them and actively opposed the government of the Restoration. In 1826 he returned to Geneva, where he began the publication of *Le Journal de Genève*. Returning again to Paris some time before the end of the reign of Charles X, he entered journalism. In July, 1830, Fazy was one of the first to sign the protest of the journalists against the ordinance restricting the freedom of the press. He participated in the July revolution, favored the establishment of a republic, opposed the candidature of the Duke of Orléans, and became a member of the Radical opposition. He published the *Revue Républicaine*, and his advocacy of radical republican principles resulted in his being fined and imprisoned. In 1833 Fazy returned to Geneva. His attacks on the Swiss government in the *Revue de Genève*, which he established, resulted in the overturning of the Conservative party in October, 1846, and the establishment of the Liberal régime. Until the fall of the Liberal party from power in 1864, the history of Fazy was that of the canton, in which, from 1847 to 1853 and again from 1855 to 1861, he held the highest office. He occupied a prominent place in the Swiss Federation, and was one of the authors of the constitution of 1848. In his later years he lived quietly as professor of international law at the University of Geneva. Among his published works are, besides novels and dramas, *L'homme aux portions: Conversations politiques et philosophiques* (1821); *Principes d'organisation industrielle* (1830); *Histoire de Genève* (1838–40); *De l'intelligence collective des sociétés* (1874). Consult Henry Fazy (a cousin), *James Fazy, sa vie et son œuvre* (Geneva, 1887).

FEA, fā'ȧ, CARLO (1753–1836). An Italian archæologist, born at Pigna. He studied law and received the degree of LL.D. from the University of La Sapienza, but later, in 1798, took holy orders that he might have better opportunities to prosecute his study of archæology. He was for years director of excavations in Rome. His valuable works on archæology consist of the following: a translation, with notes (1783–84), of Winckelmann's *Geschichte der Kunst; Miscellanea filologico-critica ed antiquaria* (1790–1837); *L'integrità del Panteone rivendicata a M. Agrippa* (1807–20); *Relazione d' un viaggio ad Ostia ed alla villa di Plinio* (1802); an edition of the works of Horace (Rome, 1811); *Della statua di Pompeio Magno del palazzo Spada* (1812); *Iscrizioni di monumenti publici* (1813); *Descrizione di Roma* (1822). In 1820 he published new fragments of the *Fasti* (q.v.) *Consulares*, in his *Frammenti di Fasti Consolari*. He is the principal founder of the modern study of Roman topography.

FEAL AND DI'VOT (Scotch *feal*, sod, probably from Swed. *vall*, sward, pasture, and *divot*, turf). A prædial servitude, peculiar to the law of Scotland, in virtue of which the proprietor of the dominant tenement possesses the right of turning up and carrying off turf from the servient tenement for the purpose of building fences, roofing houses, and the like. This, as well as the servitude of fuel, implies the right of using the nearest grounds of the servient tenement on which to lay and dry the turf peats or feal. These servitudes do not extend beyond the ordinary uses of the actual occupants of the dominant tenements. They are strictly analogous to the commons, especially the common of turbary, of the English common law. See COMMON; PROFIT À PRENDRE.

FEAL'TY (OF. *fealte, feaute, feelteit*, from Lat. *fidelitas*, faithfulness, from *fidelis*, faithful, from *fides*, faith, from *fidere*, to believe). The obligation which binds the vassal or tenant to his feudal lord; "the very essence and foundation of the feudal association," in the words of Chancellor Kent. The oath of fealty, which was inseparable from almost every feudal tenure of land, took the following form: "Know ye this, my lord, that I shall be faithful and true unto you, and faith to you shall bear, for the lands which I claim to hold of you, and that I shall lawfully do to you the customs and services which I ought to do at the terms assigned, so keep me God and His saints." The right of the landlord to fealty is still an incident of tenure in England, although it is not exacted, except from copyholders. It is obsolete in this country. It was retained by statute in some of our States, for a time after their separation from England, but it was not enforced, and the oath of fealty has resolved itself here, as it has in England, into the oath of allegiance (q.v.). Consult Kent, *Commentaries on American Law* (14th ed., 4 vols., Boston, 1896).

FEAR (AS. *fær*, Ger. *Gefahr*, danger; connected with Gk. πεῖρα, *peira*, trial, attack, περᾶν, *peran*, to cross, Skt. *par*, to cross). A term which has been used in two senses in psychology. (1) As one of the cardinal emotions of time (see EMOTION), the opposite of hope, fear is essentially a transient experience, passing of necessity into one or other of the qualitative emotions, alarm and relief. But, since fear and alarm are both unpleasurable and the passage from the one to the other is not definitely marked in consciousness, fear is also used to designate (2) the state of fear fulfilled, for which alarm is the better term. Fear proper is an unpleasant expectation (q.v.); fear fulfilled is a typical emotion of quality, with characteristic expression. Darwin seeks to explain the bodily phenomena of fear, in part, by appeal to the principles of habit, association, and inheritance. We open the eyes and raise the eyebrows, e.g., that we may see as clearly as possible all that is going on about us. In past generations fear-stricken men have taken to headlong flight or struggled violently with their enemies, and the utter prostration, pallor, sweat, and trembling of this exertion still appear when the emotion is set up, though the actual movements of escape or resistance are not made. He admits, however, that the symptoms are directly due, in part, to "disturbed or interrupted transmission of nerve force from the cerebrospinal system to various parts of the body." James seems to agree when he says that "trembling, which is found in many excitements besides that of terror, is quite pathological." The standing on end of the hair in extreme fear Darwin regards as a relic of the bristling up of animals, whose appearance is thus made more terrible to their antagonists.

Fear is exceedingly contagious, as the records of battles and of commercial crises sufficiently show. Morbid fears play a large part in the classification of insanity (q.v.), and are also connected with certain organic and functional diseases of the heart (panphobia). Consult: Darwin, *The Expression of the Emotions* (London, 1890); James, *Principles of Psychology* (New York, 1890); Mantegazza, *La physiognomie et l'expression des sentiments* (Paris, 1885); Mosso, *Fear* (London, 1896).

FEAR, CAPE. See CAPE FEAR.

FEARN, fẽrn, RICHARD LEE (1862–). An American newspaper correspondent. He was born at Mobile, Ala., studied at the University of the South and the University of Alabama, and graduated from Stevens Institute of Technology in 1884. He was secretary of foreign affairs for the Chicago Exposition in 1891–93. Entering journalism, he was a member of the *Brooklyn Eagle* staff in 1886–91; was Washington correspondent in 1893–97 and London correspondent in 1896 for the United Press; and after 1896 was a member of the New York *Tribune* staff and chief of its Washington bureau in 1902–09. He was president of the Gridiron Club (Washington) in 1906.

FEARNE, fẽrn, CHARLES (1742–94). An English legal author, born in London. He was the son of Charles Fearne, well known as judge advocate of the Admiralty. The younger Fearne was educated at Westminster School and made his way to the bar through the Inner Temple. He was a man of many gifts and of more varied attainments than are often found in the masters of the legal profession, and was especially addicted to classical studies and to the making of mechanical inventions, in which he was an adept. Notwithstanding these distractions and a certain love of ease which often paralyzed his energies, his extraordinary legal talents, and especially his capacity for refined analytical reasoning, speedily made him a leader of the English bar. He was only 30 years old when he produced the remarkable *Essay on the Learning of Contingent Remainders and Executory Devises,* on which his fame mainly rests.

It was characteristic of Fearne that he should have devoted himself to the elucidation of the most technical and abstruse doctrine of the law of real property. It was as a piece of artificial mechanism, ingeniously calculated to produce certain practical results, that it attracted him, and he did nothing to furnish it with a philosophical or rational basis—perhaps an impossible task. But his analysis of the doctrine, his arrangement of its parts, and his description of its complicated operation gave it a foremost place in the artificial system of which it formed a part. The essay at once became a standard textbook of real-property lawyers, taking its place with Littleton's Tenures, and Coke upon Littleton, and in the decade after its publication went through several editions. It has retained its place as a legal authority and has had much learning expended upon it by subsequent editors. The best editions are those of Butler (1809–24) and J. W. Smith (1831).

Fearne's success at the bar was equally conspicuous. He was said to have been "more consulted than any man of his time," and for a time he enjoyed a great professional income. But he soon wearied of the exclusive devotion to legal pursuits which his position in the profession called for, and allowed his practice to slip away from him, and fell into straitened circumstances. He died at Chelmsford, Feb. 25, 1794, broken in mind and body, at the comparatively early age of 52. His published works include an historical sketch of land tenures in England, an "Impartial Answer" to a letter of "Junius" (published in 1770), and a volume of posthumous legal essays (1797).

FEARNLEY, fẽrn'lĭ, CARL FREDERIK (1818–90). A Norwegian astronomer. He was born at Frederikshald, and after studying at Christiania, was appointed Hansteen's assistant at the astronomical observatory in that city. After further studies at Bonn and Königsberg, Germany, he returned to Christiania to prosecute his investigations. In 1857 he became professor of astronomy at the university, and in 1861, upon the resignation of Hansteen, succeeded him as director of the observatory. In 1876 he was appointed chairman of the commission for the geodetic survey of Norway. In addition to numerous essays in Norwegian and German reviews, he published: *Zur Theorie der terrestrischen Refraktion* (1884); *Zonenbeobachtungen der Sterne zwischen 64° 50′ und 70° 10′ nördlicher Deklination* (1888); *Katalog von 3949 Sternen* (1890).

FEARNLEY, THOMAS (1802–42). A Norwegian painter, of English parentage, brother of the preceding, born at Frederikshald. He studied at Christiania, Copenhagen, and Stockholm, and from 1829 to 1830 was the pupil of Dahl at Dresden. A constant traveler, living but little in his own country, he spent some time in England, where he exhibited at the Royal Academy and British Institute (1837–38). His art has points of resemblance to that of Corot and Constable, but is more primitive. At best his landscapes are good in color and his treatment is sincere and harmonious. Among the best of them are: "Justedal Glacier" (1829); "View of Romsdalshorn"; "Grindelwald"; "View of Stockholm" (Hamburg Museum); "Gravensford," "Labrofos Waterfall" (Christiania Gallery); "Hilly Landscape" (Weimar Museum). His clever caricatures of Turner also deserve mention.

FEAST OF FOOLS. A survival into and through the Middle Ages of the spirit of the Roman Saturnalia (q.v.). The details of its observance varied much in different places, but it was everywhere marked by the same broad, boisterous drollery. The donkey played so frequent a part in the pageantry that he often imposed his name on the celebration. (See ASS, FEAST OF THE.) In every instance there was more or less attempt at dramatic representation, the theatre being generally the chief church of the place, and the words and action of the drama being often ordered by its book of ceremonies. Several rituals of this sort are still preserved. That which was in use at Beauvais, in France, has a rubric ordering the priest when he dismisses the congregation to bray three times, and ordering the people to bray three times in answer. As the ass was led towards the altar he was greeted with a hymn of nine stanzas, of which the first runs thus:

"Orientis partibus,
Advenavit Asinus,
Pulcher et fortissimus,
Sarcinis aptissimus.
Hé, Sire Âne, hé!"

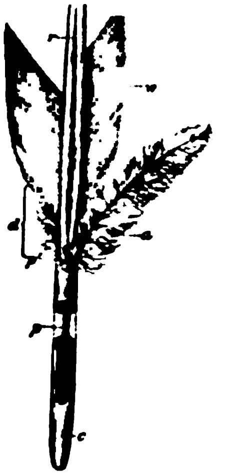
[From the regions of the East—
Blessings on the bonny beast!—
Came the donkey, stout and strong,
With our packs to pace along.
Bray, Sir Donkey, Bray!]

Where the ass did not come upon the stage the chief point of the farce lay in the election of a mock pope, patriarch, cardinal, archbishop, bishop, or abbot. These mimic dignitaries took such titles as Pope of Fools, Boy Bishop, Patriarch of Sots, Abbot of Unreason, and the like. On the day of their election they often took possession of the churches, and even occasionally travestied the performance of the Church's highest office. The license which finally prevailed in these mummeries at length called for the intervention of ecclesiastical authority, and the bishops and popes began to prohibit them. The Feast of Fools maintained itself in many places till the middle of the sixteenth century. At Antibes, in the south of France, it survived till the year 1644. The scene was a church, and the actors, dressing themselves in priests' robes turned inside out, read prayers from books turned upside down, through spectacles of orange peel, using coal or flour for incense, amid a babblement of confused cries and the mimic bellowings of cattle and grunting of pigs. Consult Tilliot, *Mémoires pour servir à l'histoire de la fête des fous* (Lausanne, 1741), and see also Boy Bishop; Misrule, Lord of.

FEAST OF WEEKS. See Weeks, Feast of.

FEASTS. See Festivals.

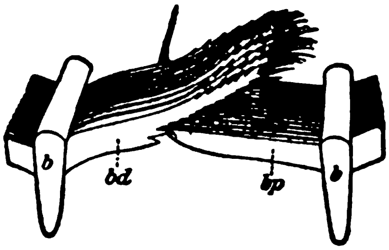
FEATH'ER (AS. *feþer*, Ger. *Feder;* connected with Lat. *penna*, feather, Gk. *πτερόν*, *pteron*, wing, from *πέτεσθαι*, *petesthai*, Skt. *pat*, to fly). One of the numerous complicated outgrowths from the skin forming the protective coat or plumage of birds and peculiar to this class. They exist in great variety, and serve various ends in bird economy, and are applied to diversified uses in human arts and industries.



PARTS OF A FEATHER.

c, calamus or "barrel," part of which has been cut away to show the series of horny "pith" cups (*p*), continued (at *p'*) through the umbilici-form pit whence arises the aftershaft (*a*); *r*, rachis; *w*, web or vane, each line here representing a "barb" or ramus; *d*, downy portion.

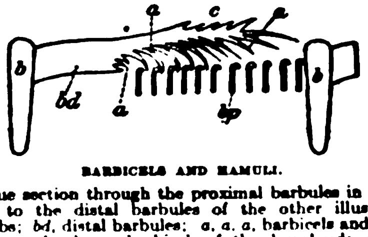
Origin and Structure of Feathers. For the probable origin of plumage as a characteristic and essential element in the class of birds, and its influence on their evolutionary development, see Bird. In the individual birds, as now known, the first sign of feathers appears in the embryo, about the fifth day of incubation of the egg, as slight, backward-leaning, conical pimples which arise from the mesoderm. (See Embryology.) Such a pimple gradually sinks into the skin, forming a follicle with the papilla rising in its centre; and the walls of this follicle and surface of the papilla are formed of Malpighian cells. This central papilla forms the "feather pulp," and its upper portion becomes changed and filled with blood, forming the nutritive organ of the feather. In the space between the pulp and the walls of the follicle the feather is molded, by the hardening and splitting off of the three superficial layers of cells. The innermost and thinnest stratum forms a transparent sheath for the pulp, and persists ultimately as the series of thin caps observable in the stem of a feather. "The middle stratum is the thickest and becomes the feather itself, while the outermost forms a transparent and coherent cylindrical sheath, which incloses the growing feather, giving it its well-known spinelike appearance ["pin feather"], until, pealing off as scurf, it sets free the rami (vanes) of the young product." (Newton.) This is the history of the first growth, but the process is substantially the same for all feathers, which arise from the same pulps. For an account of the periodical shedding and renewal of plumage, see Molting. See also Integument; Skeleton.



STRUCTURE OF A FEATHER.

Perspective view of a portion of two adjacent barbs (*b, b*), looking from the shaft towards the edge of the vane; *bd*, posterior or distal barbules, overlapping and looking into the proximal or anterior barbules (*bp*) of the next barb.

A complete feather consists of a shaft and a vane. The shaft is made up of the cylindrical hollow barrel, or calamus, which extends to the beginning of the vane, where it is succeeded by the opaque, pith-filled, squarish stem or rachis; in many birds the feather also bears upon the inside of its calamus an aftershaft, or hyporachis, which is a counterpart of the main feather, and occasionally, as in the emu, may equal it. The vane, or web, is the bladelike expansion along the sides of the distal part of the feather and consists of several elements: first, a row of horny lamelli, called barbs or rami, which are wedge shape in section, the thin edge being turned towards the bird's body. Their number varies: a crane's wing feather, 14 inches long, has about 650 in its inner web. These barbs bear on each side similar lamelli, called barbules or radii, very minute and exceeding a



BARBICELS AND HAMULI.

Oblique section through the proximal barbules in a plane parallel to the distal barbules of the other illustration: *b, b*, barbs; *bd*, distal barbules; *a, a, a*, barbicels and hamuli of the ventral side; *c*, barbicels of the dorsal side, without hamuli; *bp*, barbicels of the proximal barbules.

million in number for such a feather as the crane's; and each one of these has its upper margin turned over like a flange, towards the rachis; furthermore, the end of each radius on that side of the ramus which looks towards the tip of the feather is split up into a fringe of hooks that reach over the radii of the next forward row and hook on to their flanges, thus connecting them all into the firm, springy, and almost air-tight fabric presented by most surface or "contour" feathers—especially a "flight feather," as a wing quill (remex) or a tail quill (rectrix). Other kinds of feathers, as the soft and fluffy underlying downs, the hairlike, degenerate filoplumes, and scaly or wiry feathers, exhibit the absence of some or all of these connecting parts, or their modification.

The purpose of the feathers is mainly protection from cold and wet; they are exceedingly warm because their substance (resembling horn) is a poor conductor of heat, checking radiation, and because of the air which they contain or entangle forming a blanket of dry air about the body. To enable them the better to resist wet, most birds are provided with a store of grease in the oil gland (see Bird), with which they often anoint the plumage. Moreover, the skin of many birds, especially aquatic species of cold climates, is covered with a thick coating of *down feathers*, each of which is composed of a very small soft tube lying in the skin, from the interior of which arises a minute tuft of soft filaments, without any central shaft. This downy covering secures warmth without weight, like the soft fur at the base of the hair of Arctic mammals, and is an adaptive survival of the earliest form of plumage.

The embryo within the shell, and afterward in the nest, is clothed with "nestling down," which consists of short, incomplete, nearly colorless feathers, called neossoptiles, which in some birds grow only on limited spots or, rarely, do not appear at all; and sometimes they resemble hairs or bristles more than feathers. This first coat soon disappears, being pushed off in the first molt by the growth of the real plumage, which arises from the same places and areas as did the nestling down.

Feather Tracts. Feathers do not grow uniformly over the body as might be supposed, but are arranged in definite areas, called feather tracts or pterylæ. These consist chiefly of contour feathers, but also bear many filoplumes and sometimes true down. The arrangement of the pterylæ forms a special study in ornithology known as pterylography. (See Bird; Pterylosis.) Feathers grow with great rapidity, and in some birds attain a length of more than 3 feet. They are almost always renewed at least once, and in some cases partially or wholly twice, annually; hence it may readily be conceived how much vital energy must be exhibited in their development and how critical the period of molting must be. The plumage is generally changed several times before it attains the state characteristic of the adult bird; these changes may occupy a period ranging from one to five years, but some birds attain their adult plumage with the first molt. (See Molting.) When the sexes differ in color, as they frequently do, the young birds resemble the duller colored sex, generally the female. When the male in breeding plumage is brighter colored than the female, he usually dons a coat similar to hers after the breeding season is over.

Colors of Plumage. The colors of the feathers, to which birds owe their distinctive appearance and beauty, may be due to pigments lodged in the substance of the feather, or it may be the result of a condition of the surface which interferes with the complete deflection of light. To the latter cause is due the metallic sheen of the gorget of a hummingbird, the eyes of a peacock's tail, the "livelier iris" of the burnished dove. It is, in fact, an iridescence. Notwithstanding their extravascular nature, feathers undergo a change of color after they are completely formed, but such changes obviously cannot be due to any new deposits of pigment in the feather, for it is actually dead tissue. No subject connected with ornithology has been more earnestly discussed in the last few years than the method of color change in birds. Those who hold that birds can change color by some unexplained changes in the feathers are rapidly losing ground, however, and those who have given the subject most careful study are agreed in rejecting this theory of *aptosochromatism*, as it is called. It is well known now that most remarkable changes in color are produced merely by the wearing away or abrasion of the tips of the feathers, and this process, combined with the ordinary changes in the molt, is thought to be sufficient to account for all possible color changes.

Feathers vary in form in different parts of the body and afford important zoölogical characters for the distinction of species. For those of the wings and tail and their service in flying, see Bird; Flight. Consult: Coues, *Key to North American Birds* (Boston, 1903); Beebe, *The Bird* (New York, 1906); Pycraft, *A History of Birds* (London, 1910); and for fossil feathers, Shufeldt, *Journal of Geology*, vol. xxi (Chicago, 1913).

Uses of Feathers. The chief uses to which feathers are applied in the arts are three—*pens*, due to the peculiar elasticity of the barrels; *bed feathers*, due to the combined softness and elasticity of the barbs; and *ornament*, due to the graceful forms and delicate tints of the whole feather. The mode of preparing the barrels for pens is described under Quill.

Bed feathers were used in England in the time of Henry VII, but it is not known how much earlier. At the present day, goose feathers are preferred, the white rather than the gray. What are called *poultry* feathers, such as those of the turkey, duck, and fowl, are less esteemed, on account of their deficient elasticity. Wild-duck feathers are soft and elastic, but contain an oil difficult to remove. The following is one among several modes of preparing feathers for beds: Clean water is saturated with quicklime; the feathers are put into a tub, and limewater is added to the depth of a few inches; the feathers are well steeped and stirred for three or four days; they are taken out, drained, washed in clean water, dried upon nets, shaken occasionally while drying, and finally beaten to expel any dust. The larger establishments, however, now prepare bed feathers by steaming, which is found to be a more profitable and efficient process. The *down*, which is of so light and exquisite a texture as to have become the symbol of softness, is mostly taken from the breasts of birds, and forms a warm and delicate stuffing for beds, pillows, and coverlets. The most valuable is that obtained from the eider duck, described under Eider.

Feathers used for headdresses, or other purposes of ornament, are selected according to the forms and colors which they display. The *ostrich*, a very valuable kind of feather, may be taken as an example of the way in which ornamental feathers generally are prepared by the *plumassier*. The mode of catching the bird itself is noticed under OSTRICH; it suffices here to state that the hunters endeavor to avoid injuring the feathers by blood or blows. When brought to market, the feathers are assorted according to quality; those from the back and above the wings are the best, the wing feathers next best, and the tail feathers least valued. The feathers of the male are rather more prized than those of the female. They are cleaned for use by repeated soakings and washings in water, sometimes with and sometimes without soap. There is also a process of bleaching by means of burning sulphur. When dried by being hung upon cords, the feathers pass into the hands of the dresser, who opens the fibres by shaking, gives pliancy to the ribs by scraping them with bits of glass, and curls the filaments by passing the edge of a blunt knife over them. If the feathers, whether of the ostrich or any other bird, remain in the natural color, little more has to be done; but if a change of tint be required, the feather is easily dyed. A process of bleaching is adopted before the dyeing, except for black.

The kinds of feathers chiefly used for ornament are those of the ostrich, adjutant, rhea or American ostrich, emu, osprey, egret, heron, bird of paradise, swan, turkey, peacock, argus pheasant, ibis, eagle, and grebe. White ostrich feathers are prepared chiefly for ladies' headdresses and black for the Highland regiments and for funeral trappings. The white and gray marabout-stork feathers, imported from Calcutta, are beautifully soft and light, and are in request for headdresses, muffs, and boas; the white kinds will sometimes sell for their weight in gold. The flossy kinds of rhea feather are used for military plumes, and the long brown wing feathers for brooms and brushes. Osprey and egret feathers are mostly used for military plumes by hussar troopers. Bird-of-paradise feathers are much sought after by Oriental princes for turban plumes. Cocks' feathers are also used for ladies' riding hats and for military plumes. See AIGRETTE.

Feathers in Costume. Feathers of birds have always formed a part of decorative dress of savages, and of those people removed above savagery but still of low civilization. The most showy, and perhaps the most tasteful, use of feathers was probably in those feather cloaks of which we read as a gala dress of the natives of tropical and subtropical America at the time of the Spanish Conquest. Similar decorative surfaces have been produced by many peoples of low civilization, who can procure feathers of great brilliancy and variety of color. The feathers need little preparation, and the system of mounting is the very simplest; what is wanted, then, is merely that power of arrangement of brilliant colors which is hardly ever lacking in peoples of low but established civilization. In another direction one of the most tasteful uses of feathers is that of the Zulu warriors, the men of the great military kingdom or empire constituted by Chacka in the first quarter of the nineteenth century. These soldiers, highly organized indeed for native warfare, with weapons especially adapted to their purpose and an admirable system of military command, but defenseless as compared with Europeans armed with long-range rifles, attracted the attention of Europe by their magnificent resistance to the encroachments of the British. They wore no feathers nor other brilliant decoration except in time of actual conflict, when each warrior's head was adorned with as many and as splendid ostrich feathers as even South Africa could furnish him. Somewhat in like manner the red Indians of North America used the eagle feather, and the placing of these in one or another part of the headdress or at one or another angle showed the tribe to which the wearer belonged.

In Europe feathers have always been used for plumes in the hats or helmets of men and in the headdresses of women, although directly combined with the hairdressing (q.v.), or arranged in a hat or cap. In the sixteenth century the flap hats of men of position or of military rank were adorned with drooping plumes dyed of various colors, white being rather the exception, as is denoted by the famous white plume of Henry IV, which was white because that was the color of the house of Bourbon. The epoch from about 1830 to 1850 was distinguished for the wearing of ostrich plumes upon the head in connection with the most elegant evening dress by the ladies of France and Great Britain. At the same time the *chapeau bras*, worn sometimes by military officers and sometimes by civilian officers, was decorated with a large ostrich feather, usually at the front of the flat two-pointed hat and carried along what might be called its ridge, and secured to it at intervals to prevent its floating off at one side. The famous chapeau of Murat, Napoleon's marshal and most famous of cavalry leaders, was adorned with a standing egret (aigrette), on each side of which were drooping ostrich feathers. The curious and not graceful feather-like plume of certain military hats in the service of Great Britain seem to be composed of feathers much smaller and less showy than ostrich plumes, and the effect aimed at is a smooth, nearly conical mass. Cock feathers are used for the hats of the Italian Bersaglieri, the very dark-colored feathers with a curious metallic iridescence being the ones chosen. The egret is, however, more commonly worn by women, and is often set in the most elaborate and costly fashion in gold with precious stones. It is at certain epochs of fashion a headdress of special dignity. It appears that other feathers than the actual tuft of the egret heron are often used. Marabouts are used to adorn the edges of fans, their floating delicacy seeming to add to the lightness of the pretty implement itself. Swan's-down, when used to trim gowns and children's dresses, may be considered a humble imitation of the marabout.

The interest in ornithology inspired originally by the work of Audubon has led to the formation of many societies with members pledged to wage a crusade against the killing of birds for the purposes of mere adornment. In some instances the destruction has proved so wanton that the extinction of certain feathered tribes has either followed or been narrowly averted. In the United States a league has been formed looking towards the protection by national legislation of such birds as are likely to become the prey of milliners' agents. See ORNITHOLOGICAL SOCIETIES.

Commercial Uses. Since the introduction of the steel pen and the disappearance of the quill from correspondence, the chief commercial use of feathers other than adornment has been the stuffing of beds, cushions, and quilts. The introduction of the quill toothpick followed as a result of the abandonment of the quill for writing. M. Bardin, of Paris, raised annually two million geese for the purpose of supplying the quills for writing. The substitution of the steel pen threatened to overwhelm him in disaster and, in seeking for some other use for quills, he hit upon the toothpick.

For upholstery purposes feathers are considered valuable because of their lightness and elasticity. The best combination is that of goose and aquatic feathers. The feathers are plucked in the springtime from the living bird, as these are cleaner and more wholesome than those plucked from dead birds. The feathers of the eider duck would be the best of all, except for their property of matting. They are therefore more desirable for quilts than for mattresses. When chicken feathers are used in combination with those of swans, ducks, and geese, the feathery portion is plucked from the quill in order to insure a uniform softness. The feathers are prepared by being subjected to a powerful drying process in a heated compartment. They are then shaken thoroughly. Otherwise they would be likely to breed disease and vermin. Even carefully prepared, they are no longer regarded as the most hygienic mattresses, and the use of hair has become quite general in their stead. Germany, Russia, and France are the chief countries engaged in feather raising.

FEATH'ERBACK (so called from the form of the dorsal fin). One of a family (Notopteridæ) of isospondylous fishes of West Africa and the Orient, which form a transition between the least specialized bony fishes and the ganoids. Outwardly they are characterized by their lozenge-like outline, the tail tapering to a point, and the caudal fin being continuous with the long anal. Both the body and head are covered with small scales, the base of the skull is double, the opercular bones are incomplete, and there is no adipose fin. Three species are known inhabiting brackish estuaries and lagoons in India and Borneo, and two species in West Africa; none exceeds 2 feet in length.

FEATHER GRASS (*Stipa*). A genus of grasses. The species, of which there are about 100, are mostly natives of warm temperate climates. All have a peculiarly graceful appearance which is due to the great length of the awns. In some of them the awn is beautifully feathered. This is the case in the well-known species, the common feather grass (*Stipa pennata*), found on dry hills in the middle and south of Europe. It is perennial, easy of cultivation, and ornamental. When gathered before the seeds are ripe, its feathery awns remain attached, so that tufts of feather grass retain their beauty throughout the winter. A variety, *Stipa pennata neo-mexicana*, is indigenous to the United States. A number of other species are native in the United States; among them are *Stipa avenaceum*, black oat grass, and *Stipa spartea*, porcupine grass. In these the awns are rigid rather than feathery. The esparto (q.v.) grass (*Stipa tenacissima*) of Spain is nearly allied to the common feather grass.

FEATHER RIVER. A river with numerous head streams which rise in northeastern California, in the Sierra Nevada Mountains, and flow in a generally southwest direction, uniting in Butte County, a few miles northeast of Oroville (Map: California, D 3). From this point the Feather runs nearly due south, receiving Yuba River and Bear Creek on the east, and joining the Sacramento in Sutter County, about 15 miles above Sacramento. The stream is about 200 miles long, but is navigable only to Marysville, a distance of 30 miles. It flows through one of the richest gold fields in the State, and the scenery is magnificent in its upper course.

FEATHER STAR, or ANTEDON. See CRINOIDEA.

FEATH'ERSTONE. A coal-mining town in the West Riding of Yorkshire, England, 2 miles west of Pontefract. It was the scene of a riot on Sept. 7, 1893, which occasioned a royal commission of inquiry owing to the killing of two miners, and the wounding of others, by the military. In 1912 the Local Government Board approved of a proposal to begin the erection of a group of workmen's dwellings. Pop., 1901, 12,100; 1911, 14,377.

FEATHERSTONHAUGH, fĕтн'ẽr-ston-hạ, GEORGE WILLIAM (1780–1866). An English author and geographer. He spent the early part of his life in travel in the western part of the United States and in the Canadian Northwest. In 1834–35 he was employed by the War Department in making geological surveys in the region now included in Wisconsin, Iowa, and Minnesota. In 1842 he was appointed a commissioner to act for the British government with Lord Ashburton in drawing up the Webster-Ashburton Treaty, and to determine the boundary between the United States and Canada under the treaty. For these services he was appointed to the consular service, serving as British Consul for the departments of Calvados and Seine, France, where he died. His numerous publications include: a translation of *The Republic of Cicero* (1828); *Geological Report of the Elevated Country between the Missouri and Red Rivers* (1834); *The Geology of Green Bay and Wisconsin* (1836); *Observations on the Ashburton Treaty* (1842); *Excursion through the Slave States* (1844); *Canoe Voyage to the Minnesota* (1847).

FEATHERWING. See PLUME MOTH.

FEBIGER, fē'bĭ-gẽr, JOHN CARSON (1821–98). An American naval officer, born in Pittsburgh, Pa. He entered the navy Sept. 14, 1838, and served successively on the *Macedonian*, the *Concord*, the *Chippola*, the *Potomac*, the *Dale*, the *Columbus*, and the *Germantown*, and saw much hard work in South American and African waters. Commissioned a commander Aug. 11, 1862, he successively commanded the *Kanawha*, of the West Gulf blockading squadron (1862–63), which was conspicuous in the engagement in Mobile Bay, April 2, 1862; the *Osage*, *Neosha*, and *Lafayette*, of the Mississippi squadron; and the *Mattabeset* of the North Atlantic blockading squadron, which participated in the spirited engagement with the ram *Albemarle* in Albemarle Sound, N. C., in May, 1864. From 1866 to 1868 he commanded the *Ashuelot*, of the Asiatic squadron. He was made a commodore in 1874, and from 1876 to 1880 was commandant of the Washington Navy Yard. On Feb. 4, 1882, he was promoted to the rank of rear admiral, and was retired in the following July.

FEB'RIFUGE (from Lat. *febrifugia*, centaury, a plant supposed to cure fever, from *febris*, fever + *fugare*, to put to flight, from *fugere*, to flee). A medicine calculated to remove or cut short a fever (q.v.). The term was much used before the nature of infection was understood, and before it was understood that a certain amount of fever is necessary to the completion of the chemical process by which oxidation of poisonous products is accomplished. Among the febrifuges are aconite, antipyrin, acetanilid, phenacetin, and sweet spirit of nitre. Some of these are absolutely dangerous in certain fevers, as in the rise of temperature of pneumonia. Quinine is an efficient febrifuge in many cases. In typhoid fever (q.v.) and in pneumonia (q.v.) cold water is an excellent febrifuge.

FE'BRIS DIA'RIA. See EPHEMERA.

FEBRO'NIANISM. In theology, a system of doctrine asserting the independence of national churches and the rights of individual bishops in matters of local discipline and church government—in other words, Gallicanism. (See GALLICAN CHURCH.) It holds that the final court of appeal is a general council of the church, and the Pope, as well as other prelates, is subject to its authority. The name is derived from the nom de plume, Justinus Febronius, assumed by Johann Nikolaus von Hontheim (q.v.), Coadjutor Bishop of Trèves, in a work on these subjects (1763), which led to a violent and protracted controversy.

FEB'RUARY. See MONTH.

FEBRUARY REVOLUTION, THE. The revolution of 1848, which brought about the downfall of the July monarchy in France and the establishment of the Second Republic. The immediate cause was the political contest against the Guizot ministry, but the underlying factor in the situation was the dissatisfaction of all classes with the policy of stagnation of the régime of Louis Philippe and the seething discontent of the working classes with a completely bourgeois, business administration. The July monarchy had disappointed the expectations of all. It had not supplied bread for the workers, nor glory for the Patriots, nor persecution of the Church for the Voltaireans, nor a clerical régime for the Catholics. The one thing it had done was to increase the possessions and power of the upper middle class. But Guizot's "enrichissez-vous" was not addressed to a large enough part of the population to keep the Orléanist monarchy in power. The very restricted property franchise and the insidious attacks on popular rights roused the Liberals and Socialists. The Republicans of the Left combined with bourgeois Socialists and with Revolutionaries of the type of Blanqui and Barbés. (See GUIZOT.) The agitation leading to the Revolution began in 1847, when the more radical factions held banquets in which a propaganda was carried on for the lowering of the tax-paying qualification for voting, which at this time was 200 francs. Gradually at these banquets the usual royal toasts disappeared, and finally, on Feb. 21-22, 1848, the government forbade a great reform banquet in Paris. The people were aroused by this arbitrary act of the ministry, and by the following day the Revolution had become an accomplished fact. Barricades sprang up everywhere in Paris, the workingmen armed themselves, and Guizot was dismissed. It seemed as if the last measure would end the disturbance; but a small riot created the impression that the government was dissembling, and matters became worse than before. In vain Louis Philippe abdicated in favor of his grandson, the Count of Paris. Nothing would satisfy the populace of Paris now but a republic, and the King, losing heart, fled (February 24). A provisional government was formed, in which the leaders were Arago, Crémieux, Blanc, and others, and by clever manipulation gained over the spontaneous radical assembly at the hotel de ville, so that the Moderates were kept in power. But they were unable to resist the demands of the proletariat and, as a concession, established a sort of Labor ministry at the Luxembourg under the presidency of Louis Blanc. National workshops were also established on Louis Blanc's suggestion to provide work for the starving workingmen of Paris. On February 26 a decree was adopted, as follows: "The government of the French Republic undertakes to guarantee the existence of the workman by labor and to provide labor for all citizens," and on the following day national workshops were actually established. Laborers from all over France thronged to Paris, and the government soon found itself burdened with the support of an army of 100,000 men for whom it could find no work. No effort having been made to organize the national workshops on productive and efficient lines, on May 4 a National Assembly of 900 members was convened and intrusted the government to an Executive Committee of five members, which in its turn was to appoint the ministers. In this Constituent Assembly the more conservative Republicans obtained control. This led to violent demonstrations on the part of the Extremists. On May 15 there was an unsuccessful rising under Barbés, Blanqui, and others, having for its object the dissolution of the Assembly. The closing of the national workshops on June 21 was followed by a bloody insurrection, June 24-26, in the course of which more than 4000 workmen perished on the barricades. The Assembly on November 4 adopted a constitution for France. There was to be a president elected for a term of four years, and a single legislative chamber of 750 members. The election was in December, 1848, and the candidates for the presidency were Ledru-Rollin (Socialist), Cavaignac (Conservative), and Louis Napoleon. (See NAPOLEON III.) The last carried the election; for the charm of the great Napoleon's name was on the increase in France, now that the glories of his reign were remembered and the evils long forgotten. By electing the head of the Imperialist party, the country virtually decreed the downfall of the Second Republic. See FRANCE.

In other countries of Europe the February Revolution had a marked effect. Throughout the whole Continent the cause of popular liberty had been suffering from the policy of Metternich (q.v.), and the news from Paris proved to be the impetus necessary to arouse the people. Especially was this true of Germany and Austria. In the former country an attempt was made to carry out the union, which had been hoped for in 1815; but though a parliament assembled at Frankfort, 1848-49, it produced no lasting results. In some of the individual states, notably Prussia, constitutions were obtained, which never again disappeared entirely. In Austria Metternich was overthrown, and for a long time Austrian supremacy in Italy and Hungary was seriously menaced. See Germany; Prussia; Austria-Hungary; Italy. Consult: Stein, *Geschichte der sozialen Bewegung in Frankreich* (Leipzig, 1850); Haym, *Die deutsche Nationalversammlung* (3 vols., Berlin, 1848–50); Louis Blanc, *Histoire de la révolution de 1848* (Paris, 1870); *La révolution de février au Luxembourg* (ib., 1849); Lamartine, *Histoire de la révolution de 1848* (ib., 1859); Thomas, Emile, *Histoire des ateliers nationaux* (ib., 1848); Weill, G., *Histoire du parti républicain en France de 1814 à 1870* (ib., 1900); Blanqui, *Les classes ouvrières en France pendant l'année 1848* (ib., 1849); Robinson and Beard, *Development of Modern Europe* (2 vols., New York, 1910).

FEB'RUUS. An epithet of Faunus (q.v.), conceived of as a god of purification and, through such purification, of fertility in man and beast. The ceremony itself, called *februa*, was held on February 15; *Februarius* (*Mensis*) was the "month of purification." In it occurred the great festival in honor of the dead, the *Parentalia*. Later the Romans made Februus an independent god and worshiped him also as a god of the lower world and identified him with the Greek Pluto. Consult Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

FEBVRE, fĕ'vr', Alexandre Frédéric (1835–). A French comedian, after 1867 a member of the Comédie Française. He was born in Paris and was a musician till he was called above the footlights to fill, it is said, an accidental vacancy. He played for a time in Havre, then in Paris, chiefly at the Ambigu, Beaumarchais, Porte-Saint-Martin, Gaîté, Odéon, and Vaudeville theatres. At the Odéon, especially, he created rôles in *Daniel Lambert* and *Le rocher de Sysiphe*. Having won a reputation, he made, in 1866, his début at the national theatre, as Philippe II in *Don Juan d'Autriche*. His most frequent successes were in modern comedy, among his creations being rôles in *L'étrangère*, *L'ami Fritz*, *Daniel Rochat*, *Les corbeaux*, *Le roi s'amuse*, and *Margo*. In 1894 he made a tour of the principal cities of Europe. The following year he was sent to the United States to make a study of the American stage. His published works include: *Au bord de la scène* (1889); *Le journal d'un comédien* (1896); *La clef des champs* (1899); *Le roman d'un m'as-tu-vu*.

FÉCAMP, fā'käɴ' (OF. *Fescamp*, Lat. *Fiscannum;* derived by popular etymology from Lat. *Ficus Campus*, Fig Plain, on account of a legend that a fig tree, in which some of the precious blood of Christ had been placed by Joseph of Arimathæa, was washed ashore there). A manufacturing town and seaport in the Department of Seine-Inférieure, France, situated in a narrow valley of the Fécamp, flanked on either side by steep cliffs, on the English Channel, 23 miles northeast of Havre (Map: Northern France, F 3). Its principal buildings are the abbey church of the Benedictines, in the early Pointed eleventh to sixteenth century style; a pilgrimage chapel, Notre Dame du Salut; the church of Saint Etienne, a museum, a library of 12,000 volumes, and a hospital. The harbor is a port of entry for English colliers and Baltic timber ships and fishing vessels. Fécamp has cotton mills, foundries, cordage works, agricultural machinery works, tanneries, oil mills, distilleries and textile factories. It has also large herring fisheries. Pop. (commune), 1901, 15,381; 1911, 17,383. The town was built up from a convent founded in 664, which was destroyed in 841 by the Northmen. In 998 Richard I, Duke of Normandy, rebuilt it as a Benedictine abbey.

FECHNER, fĕĸ'nĕr, Gustav Theodor (1801–87). A German physicist and philosopher, the founder of modern psychology and psychophysics. He was born in the village of Gross-Särchen, near Muskau, in Lower Lusatia. After completing his school education at the Kreuzschule, in Dresden, Fechner in 1817 entered the University of Leipzig as a student of medicine. Disappointed at the unscientific character of his medical teaching, and strongly influenced by Oken's *Naturphilosophie* and Biot's *Physics*, he soon turned his attention to the study of theoretical and experimental physics, and after Gilbert's death, in 1824, lectured as a substitute for the professor. From this date till 1845 he made valuable contributions to the doctrine of electricity, his well-known *Massbestimmungen über die galvanische Kette* being issued in a single volume in 1831. In 1833 he was appointed associate professor and in 1834 full professor of physics in the University of Leipzig. In 1838–40 he was engaged upon investigations in the sphere of physiological optics. Meantime he had, under the pseudonym of Dr. Mises, published a long series of humorous and satirical essays, of which we may mention the *Proof that the Moon is Made of Iodine* (1821), a sharp arraignment of the existing state of materia medica, and the *Comparative Anatomy of the Angels* (1825), a work of delicate humor, containing in germ many philosophical ideas which were later put forward with serious intention. In 1839 Fechner published a notable piece of art criticism, and in 1841, as Dr. Mises, a volume of lyric poetry. The years 1840–43 were spent, for the most part, in the .sick room—Fechner had broken down nervously and was threatened both with blindness and with insanity. His recovery, when it set in, was rapid and complete. He now turned his thought towards philosophy, and issued in 1846 an ethical treatise, *Ueber das höchste Gut*. This was followed in 1848 by the curious but most suggestive work, *Nanna, oder über das Seelenleben der Pflanzen*, in which mentality, of however low an order, is ascribed to the plant world, and this in turn by the *Zend-Avesta, oder über die Dinge des Himmels und des Jenseits* (1851), in which Fechner set forth a comprehensive system of metaphysics from the standpoint of natural science. Here we find the fundamental ideas of what was later to be elaborated as psychophysics. Finally, the work *Ueber die physikalische und philosophische Atomenlehre* (1855) marks Fechner's definitive rupture with the speculative nature philosophy of Schelling and his school. The remaining years of Fechner's life (1860–87) were devoted principally to the study of psychology and æsthetics. In 1860 appeared the epoch-making *Elemente der Psychophysik* (reprinted, 1889, 1907). We have seen that as early as 1838 Fechner was busied with psychophysical problems, and the general question of the relation of mind to body had long held his attention.

The new science called forth lively discussion, and Fechner's personal views evoked much opposition. In 1877 he published *In Sachen* *der Psychophysik*, a reply to objections by Helmholtz, Mach, Brentano, and others, and in 1882 the *Revision der Hauptpunkte der Psychophysik*, a reply to G. E. Müller's *Grundlegung der Psychophysik* (1878). In 1871 appeared *Zur experimentalen Æsthetik*, and in 1876 the profound and comprehensive work, *Vorschule der Æsthetik*. In 1879 came *Die Tagesansicht gegenüber der Nachtansicht*, a summary of the author's religious and metaphysical beliefs. Fechner's last piece of published work was, characteristically enough, an article on Weber's law (q.v.), printed in Wundt's *Philosophische Studien* (Leipzig, 1887). He died in Leipzig, Nov. 18, 1887. An important mathematical treatise, the *Collektivmasslehre*, was issued posthumously, under the editorship of G. F. Lipps (1897).

Fechner's general philosophy has not as yet received the attention that it deserves. His æsthetic work, on the other hand, has borne rich fruit. But his enduring fame will, of course, rest upon the *Psychophysik*. In this work he laid, once and for all, the foundations of an exact psychology. But he did more. He worked out a series of psychophysical measurement methods (see PSYCHOPHYSICS) which are those still employed in our psychological laboratories. He carried out extended researches, which are not only models of scientific patience and caution, but also permanent contributions to the literature of psychology. He levied tax upon all departments of scientific inquiry (see PSYCHOLOGY, EXPERIMENTAL) for facts and laws which might bear upon the psychophysical relation, bringing order and consistency into the chaos of separate observations.

Consult: Kuntze, *Gustav Theodor Fechner: ein deutsches Gelehrtenleben* (Leipzig, 1892); Lasswitz, *Gustav Theodor Fechner* (Stuttgart, 1896); and for a bibliography of Fechner's works, Fechner, *Elemente der Psychophysik*, i (3d ed., Leipzig, 1907).

FECHTER, fĕk'tẽr, CHARLES ALBERT (1824–79). A noted actor. He was born probably in London (though accounts from another source say Paris), his father being of German and his mother of Italian descent. He was educated in France, and in 1840 appeared in private theatricals; in 1841 he went with a strolling company to Italy, returning to Paris the same year and entering the Conservatoire with a view to the Théâtre Français. At the same time he studied sculpture, but gave it up for the stage, and in 1844 made his début at the Théâtre Français as Seïde in Voltaire's *Mahomet*. Afterward he played in Berlin, and in 1847 took a French company to London. In 1847 he married Mlle. Eléonore Rabut, a French actress of note. (She died in 1895.) From 1848 to 1860 he was the reigning favorite in Paris. He was the original Armand Duval in *La dame aux camélias*, in which part he won remarkable success. In 1860 he made his first appearance in English drama in London, in *Ruy Blas*, following with *Corsican Brothers*, *Don César de Bazan*, *Hamlet*, *Othello*, *Bel Demonio*, and other plays, among them an adaptation of his own called *Rouge et Noir*. While not altogether at home on the English stage, Fechter showed himself capable of appreciating the difficulties he had to contend with and, in some measure, of surmounting them. His impersonation of Hamlet was, upon the whole, one that marked him as an actor of very high powers. For a time he was the lessee of the Lyceum Theatre, playing the chief parts in most of the pieces produced. In 1870 he came to the United States, where, except for a brief return to England two years later, he thenceforward remained. He met with great success as an actor, particularly in Boston; but his imperious temper made him so many enemies that his attempts to manage theatres in both Boston and New York were speedy failures. In 1874, though his first wife was still living, he was married to Lizzie Price, an American actress with whom he had appeared in New York. In 1876, after an accident which somewhat disabled him, he retired to a farm near Quakertown, Pa., where he died. Consult Field, *Charles Albert Fechter* (Boston, 1882).

FECK'ENHAM, JOHN DE (c.1518–85). The last abbot of Westminster and the last mitred abbot who sat in Queen Elizabeth's Parliament. He was born in Feckenham Forest, Worcestershire, about 1518, and his family name was Howman. He became a monk at Evesham, and there took the name by which he is now known. He studied at Oxford. After holding other positions, in 1543 he became chaplain to Bonner, Bishop of London, and when the latter was deprived of his see, Feckenham was sent to the Tower (1549). Although for much of the time a prisoner, he was active in political matters. Queen Mary released him and made him her chaplain (1553). In 1556 Queen Mary refounded the Benedictine monastery of St. Peter, Westminster, London, and made him mitred abbot. Elizabeth was personally friendly to him, but would do nothing for him, as he would not conform to the new (Protestant) faith. All his influence was thrown against the Reformation and its doctrines. In 1559 he was removed and sent to the Tower in 1560, and though released on bail in 1574, was practically a prisoner till his death, at Wisbech, near Elyin, 1585. Consult Taunton, *English Black Monks of St. Benedict* (London, 1897).

FEC'UNDA'TION, IN PLANTS. See FERTILIZATION.

FEDERAL COUNCIL OF THE CHURCHES OF CHRIST IN AMERICA. A body which held its first meeting in Philadelphia in 1908 and was largely the culmination of previous voluntary federative movements, the chief of which had been the Evangelical Alliance and the National Federation of Churches and Christian Workers. The important preliminary work leading up to the organization was accomplished by the Interchurch Conference on Federation, a body composed of official delegates from 30 denominations, which met in New York City in 1905. This conference adopted the constitution of the Federal Council and transmitted it to the various denominations with the understanding that approval by two-thirds of them would give it full effect. This approval was secured early in 1908. The difference between the Federal Council and the previous movements is that it is not an individual or voluntary agency or simply an interdenominational fellowship, but is an officially and ecclesiastically constituted body. It is differentiated from other general movements for the manifestation of Christian unity in the fact that it is the coöperation of the various denominations for service rather than an attempt to unite them upon definitions of theology and polity. The Federal Council has no authority over the constituent bodies adhering to it, and its province lies in the expression of its counsel and the recommending of a course of action in matters of common interest to the denominational bodies, the churches, local councils, and individual Christians. It has no authority to draw up a common creed or form of government or of worship, or in any way to limit the full autonomy of the Christian bodies adhering to it. The council meets quadrennially and consists of about 400 qualified delegates officially elected by the various denominational assemblies or other constituted authorities.

The work undertaken by the council is indicated by the titles of its most important commissions, which are as follows: State and Local Federations, Foreign Missions, Home Missions, Religious Education, Social Service, Evangelism, Family Life, Sunday Observance, Temperance, and Peace and Arbitration. The Commission on the Church and Social Service also has a Committee on Church and Country Life. Other special commissions, such as the Joint Commission on Theological Seminaries, on Interdenominational Movements, and on International Relations, are appointed from time to time to take up special activities calling for united action upon the part of the churches.

The Commission on the Church and Social Service is perhaps the most conspicuous of the departments of the council in its relation to the public at large. Among the specific principles for which it asserts that the Church must stand in its relation to labor are the following: (1) the gradual and reasonable reduction of hours of labor to the lowest practicable point, and that degree of leisure for all which is a condition of the highest human life; (2) a release from employment one day in seven; (3) a living wage as a minimum in every industry, and the highest wage that each industry can afford.

While the Federal Council is constituted solely of the national denominations, it has a cooperative relationship with State and local federations. There were, in 1914, 21 State federations and about 130 city and county federations. Among the investigations made by the different commissions of the council are reports on the Country Church, on Industrial Conditions in Several Cities, and on the Church and Modern Industry. The council in 1913 had charge of the collection of religious statistics under the direction of Dr. H. K. Carroll. The constituent bodies of the council are as follows: Baptist Churches (North), National Baptist Convention, Free Baptist Churches, Christian Church, Congregational Churches, Disciples of Christ, Friends, German Evangelical Synod, Evangelical Association, Lutheran Church (General Synod), Mennonite Church, Methodist Episcopal Church, Methodist Episcopal Church (South), African M. E. Church, African M. E. Zion Church, Colored M. E. Church in America, Methodist Protestant Church, Moravian Church, Presbyterian Church in the U. S. A., Presbyterian Church in the U. S. (South), Protestant Episcopal Church Commissions on Christian Unity and Social Service, Reformed Church in America, Reformed Church in the U. S., Reformed Episcopal Church, Reformed Presbyterian Church (General Synod), Seventh Day Baptist Church, United Brethren Church, United Evangelical Church, United Presbyterian Church, Welsh Presbyterian Church. The National Offices are at 105 East 22d Street, New York City. The general secretary in 1914 was Rev. Charles S. Macfarland.

FEDERAL GOVERNMENT (Lat. *fœderatus*, bound by treaty, from *fœdus*, a treaty). When two or more states, otherwise independent, bind themselves together by a treaty or an organic act so as to present to the external world the aspect of a single state, without wholly renouncing their individual powers of internal self-government, they are said to form a federation. The contracting parties are sovereign states acting through their representatives, and the extent to which the central overrules the local legislature is fixed by the terms of the contract. In so far as the local sovereignty is renounced and the central power becomes sovereign within the limits of the federated states, the federation approaches to the character of a nation; but the only renunciation of sovereignty which a federation, as such, necessarily implies consists in abandoning the power which each separate state otherwise would possess of forming independent relations with foreign states. "There are," says J. S. Mill, "two different modes of organizing a federal union. The federal authorities may represent the governments solely, and their acts may be obligatory only on the governments as such, or they may have the power of enacting laws and issuing orders which are binding directly on individual citizens. The former is the plan of the German so-called confederation, and of the Swiss Confederation previous to 1847. It was tried in America for a few years immediately following the War of Independence. The other principle is that of the existing Constitution of the United States, and has been adopted within the last dozen years by the Swiss Confederacy. The Federal Congress of the American Union is a substantive part of the government of every individual State. Within the limits of its attributions it makes laws which are obeyed by every citizen individually, executes them through its own officers, and enforces them by its own tribunals. This is the only principle which has been found, or which is even likely, to produce an effective federal government. A union between the governments only is a mere alliance, and subject to all the contingencies which render alliances precarious."

The difference between these two dissimilar forms of federation is aptly described by the terms employed in German political philosophy to differentiate them, and for which we have no equivalent terms in English—*Staatenbund*, a federation of states, and *Bundesstaat*, a federated state. The federal governments of antiquity and of the Middle Ages were all of the former type, loosely knit confederacies, like those of Athens and the ephemeral combinations of petty Italian states in the thirteenth and fourteenth centuries. Of a similar character is the union of two or more states under a single monarch, as of Castile and Aragon under Ferdinand and Isabella, Austria and Hungary under Francis Joseph, and the union of Sweden and Norway, which was dissolved in 1905. Confederations of this character have generally proved to be unstable and of short duration, and none of those at present in existence seems likely to prove an exception to this rule. It is to the more enlightened political consciousness of modern times, and especially to the institution of representative popular governments, that the more durable type of federal government—the federated state—owes its existence. The formation of the United States of America under the present Constitution was the first attempt to realize this form of federation on a scale large enough to command the attention of the world, and the great success of the experiment of combining local independence with national power has impressed itself upon the political consciousness of Christendom. Thus, just as the British constitution has become the model of representative government for the nations of western Europe, the American federation has become the type of federal government for two continents.

One of the chief difficulties which arises in organizing a federal government of either type consists in discovering means by which disagreements between one or more of the local governments and the central government as to the limits of their respective powers are to be disposed. The arrangement by which this object was sought to be effected in America, of which Tocqueville expressed his admiration, is thus explained by Mill: "Under the more perfect mode of federation, where every citizen of each particular State owes obedience to two governments—that of his own State and that of the federation—it is evidently necessary not only that the constitutional limits of the authority of each should be precisely and clearly defined, but that the power to decide between them in any case of dispute should not reside in either of the governments, or in any functionary subject to it, but in an umpire independent of both. There must be a supreme court of justice, and a system of subordinate courts in every State of the union before whom such questions shall be carried, and whose judgment on them, in the last stage of appeal, shall be final. Every State of the union, and the federal Government itself, as well as every functionary of each, must be liable to be sued in those courts for exceeding their powers, or for nonperformance of their federal duties, and must in general be obliged to employ those courts as the instrument for enforcing their federal rights. This involves the remarkable consequence, actually realized in the United States, that a court of justice, the highest Federal tribunal, is supreme over the various governments, both State and Federal, having the right to declare that any new law made or act done by them exceeds the powers assigned to them by the Federal Constitution, and, in consequence, has no legal validity." The tribunals which act as umpires between the federal and state governments naturally also decide all disputes between two states, or between a citizen of one state and the government of another. The usual remedies between nations—war and diplomacy—being precluded by the federal union, it is necessary that a judicial remedy should supply their place. The supreme court of the federation dispenses what is in effect international law, and is the first great example of what is now one of the most prominent wants of civilized society—a real international tribunal.

A federal government, then, is a body politic composed of the people of several different, and in some respects independent, states, over which, in its own prescribed sphere, it exerts a supreme authority; while outside of that sphere the states and the people thereof are sovereign within their respective jurisdictions. The character of a federal government varies with the extent of its powers. The first form of federal government established in the United States was that created by the Articles of Confederation, adopted by the Continental Congress in 1777. The separate Colonies, finding some form of central government indispensable to the efficient prosecution of the War of Independence, gave a reluctant consent to those articles, which, while the war lasted and all felt the presence of a common danger, worked tolerably, though not without some embarrassing friction arising from notions of Colonial or State sovereignty. But after the independence of the country was established, and the pressure of a common danger no longer existed, there was a disposition to exalt the State and to depreciate the national authority, which to some extent was regarded as a burden. The national government had no judicial tribunal to make an authoritative exposition of its powers, and no executive officers to enforce its decrees; it was entirely dependent upon the voluntary action of the States for means to carry on its operations; so that, in the language of Washington, it was "little more than a shadow without the substance," and "Congress a nugatory body, their ordinances being little attended to." There was, in short, an utter want of all coercive authority on the part of the government to carry into effect its own constitutional measures. The embarrassments growing out of this state of things were endured till 1787, when a convention of delegates from the several States was held in Philadelphia, "for the purpose of revising the Articles of Confederation and reporting to Congress and the several legislatures such alterations and provisions therein as shall, when agreed to in Congress and confirmed by the States, render the Federal Constitution adequate to the exigencies of the Government and the preservation of the Union." The convention encountered many difficulties arising from diversities of opinion among its members and from conflicting local interests, but finally succeeded in framing a constitution which the people of the several States ratified, and which, with various amendments, has continued to this day. From the time of its adoption different theories of interpretation have prevailed, and these conflicting theories have to a greater or less extent determined the character and aims of political parties. It has been contended on the one side that the Union was merely a league between the several States in their organized capacity, and that each State had the right, at its pleasure, of withdrawing therefrom. On the other side it has been held that the Union, instead of being the creation of the States, as such, was formed by "the people of the United States," acting, indeed, through their respective State organizations, but still as citizens of a common nationality. According to this theory, no right of secession on the part of a State has any existence; but it is the right and the duty of the national government to maintain the Union by force. This question was brought to an issue in the Civil War, the slaveholding States seeking to exercise the assumed right of secession for the protection of slavery, and the nonslaveholding States taking up arms for the defense of the Union. The results of the war are generally regarded as a vindication of the antisecession theory, though there are still some disputed questions as to the relative powers of the national and State governments. See *Articles of Confederation*, under United States; Constitution of the United States.

Other modern examples of federal government are afforded by the Dominion of Canada, founded in 1867 by a union of the provinces of Upper and Lower Canada, New Brunswick, and Nova Scotia, and afterward enlarged by the accession of the provinces of Manitoba, British Columbia, Alberta, and Saskatchewan, and Prince Edward Island; by the Commonwealth of Australia, established in 1901 by the organic union of the several Australian colonies of Great Britain; and by the present German Empire, which was born of the sentiment of German nationality evoked by the Franco-Prussian War in 1870–71. See Constitution; Democracy; Government; Sovereignty.

Consult: Mill, *Considerations on Representative Government* (London, 1905); De Tocqueville, *Democracy in America* (2 vols., New York, 1898); Bryce, *The American Commonwealth* (rev. ed., 2 vols., ib., 1912); Burgess, *Political Science and Comparative Constitutional Law* (2 vols., Boston, 1902).

FEDERALIST, The. A series of essays issued in 1787 and 1788 in favor of the adoption of the proposed Federal Constitution for the United States. The Constitutional Convention at Philadelphia adjourned Sept. 17, 1787; the text of the new Constitution was first published in New York on September 27; and on October 27 the first number of the *Federalist* appeared in the *Independent Journal*, a semiweekly newspaper of New York, the successive essays continuing to appear therein until April 2, 1788. All of the 85 essays (the concluding eight of which did not appear until the *Federalist* was printed in book form) were published over the name of "Publius," but they were composed severally by Alexander Hamilton, James Madison, and John Jay. The authorship of several of the numbers has been the subject of prolonged and inconclusive discussion, but the chief credit for the conception of the enterprise and for its execution has at all times been given to Hamilton. In newspaper and in pamphlet form the *Federalist* had a wide circulation, and its influence was conspicuous in turning popular opinion in favor of the Constitution. Especially in New York, to whose inhabitants it was particularly addressed, it was an important factor in the conversion of the State from antifederalism to federalism. No contemporary exposition of the text of the Constitution, of the purposes of its framers, and of its relation to the actual development of the State was so complete, so scholarly, or so authoritative as was that in the *Federalist*. It has, consequently, become recognized, even by the courts, as the most reliable commentary on the Constitution and as an essential aid in the interpretation of such passages as are of obscure or disputed meaning. Many editions have been published; the latest and most useful (containing for the first time a full index of the essays) is that by Paul L. Ford (New York, 1898). In the edition edited by John C. Hamilton (Philadelphia, 1875) there is an elaborate essay on the authorship of the several papers. The discussion is almost as interesting to the antiquary as that concerning the identity of "Junius." Useful editions have also been published by H. B. Dawson (New York, 1864), H. C. Lodge (ib., 1888), and by E. H. Scott (Chicago, 1895). On the authorship of the *Federalist*, see also Bourne and P. L. Ford, in the *American Historical Review*, vol. ii (New York, 1897).

FEDERALISTS. In American history, the name given to those who in 1787 and 1788 advocated the adoption of the new Constitution of the United States, and who later contended, for the most part, for a liberal construction of the Constitution and the establishment of a strong national government. In the end Washington undoubtedly favored their views; but Hamilton, with his plans for a national bank, a sinking fund, the assumption of State debts, and the encouragement of manufactures, was the real leader of the Federalists, while Jay, John Adams, Gouverneur Morris, Ames, and later Marshall were prominent members of the party. The Federalists were conservative in their belief in popular government and had little sympathy with the French Revolution, being upon these two, as upon other points, opposed by the strict constructionists under the leadership of Jefferson and Madison, known as the Republicans, or Democratic Republicans. (See Democratic Party.) The Federalists controlled the first three administrations—those of Washington and of John Adams—but the party was disrupted by factional controversies during Adams's administration, and was overthrown by the Republican victory of 1800, which placed Jefferson in the presidential chair. Their candidates for President from 1804 to 1816 received scarcely any support outside of New England, and in 1820 no Federalist nomination was made. During these years the party was kept alive in New England by those who had opposed Adams's administration, and who formed the most aristocratic and pro-English faction. (See Essex Junto.) Their opposition to the Embargo and kindred measures, and to the War of 1812, culminated in the Hartford Convention (q.v.) in 1814. The convention was immeasurably denounced, and was fatal to the little life still left in the Federalist party. One of the last appointments of President Adams was that of John Marshall as Chief Justice of the Supreme Court, and during his tenure of that office Marshall succeeded in stamping indelibly upon the Constitution the best portions of the Federalist doctrine. Moreover, the Republicans in power gradually became scarcely less liberal in their interpretation of the Constitution than the Federalists had been before them; and while in 1798 the Federalists denounced the Virginia and Kentucky resolutions (q.v.) passed by the Republicans in favor of State's rights, in 1814 the Federalists were vigorously opposed to any extension of the authority of the central government, while the Republicans were wholly committed in this respect to the former Federalist policy. Consult Bassett, *The Federalist System* (New York, 1906), and Morse, *The Federalist Party in Massachusetts to the year 1800* (Princeton, 1909).

FEDERAL THEOLOGY. The designation of a type of Calvinism which developed in Holland during the latter part of the seventeenth century and spread to England. Its chief exponents were Johann Koch (d. 1669), Franz

Burmann (d. 1679), Hermann Wits (d. 1708), and perhaps one should add Vitringa (d. 1722). The theological system taught by these scholars was in general a system of covenants (*fœdera*), conceived as being made between God and man, whence the name "federal theology." Koch (or Cocceius) (q.v.), as he is commonly known, professor at Franeker, and afterward at Leyden, is usually regarded as the founder of the school; but the federal idea did not originate with him. Something similar had been taught by Olevianus, one of the framers of the Heidelberg Catechism, by the Swiss theologian Eglin (in his *De Fœdere Gratiæ*, 1613), and by William Ames, an English Puritan, who was professor at Franeker in Koch's student days. John Ball's *Treatise of the Covenant of Grace* proves the early currency in England of a federal system, and it is adopted in the Westminster Confession of Faith (chap. vii). It accounted for God's condemnation of man for original sin, and took the place of Augustine's theory of the unity of human nature in Adam.

Koch started with the biblical history of redemption, which he arranged under what he called covenants. By the term "covenant" he meant a promise on God's part, conditioned upon obedient acceptance of the promise by man. It is a gift rather than a contract. There can be nothing like a *quid pro quo*, for God's part is infinite and man's finite. As developed by Burmann, the federal system includes: (1) The *Covenant of Works*, made with Adam as the federal head of the race. God would give man eternal felicity, upon condition that man should remain in his first estate of holiness. This covenant was broken by the fall and was replaced by (2) the *Covenant of Grace* between God and fallen man. Man was not released from his former obligation to obedience, although, owing to the fall, he was rendered incapable of performing it. Hence God in His mercy substitutes grace for works. But in order to render this new covenant possible, God is obliged to send His Son, Jesus Christ, to supply the obedience lacking on the part of fallen man, and to be the full divine sacrifice for sin. This second covenant is arranged in three "economies"—viz., (*a*) the antelegal, or the grace promised to the patriarchs; (*b*) the legal, presented in the Mosaic system of laws and ceremonies, which are all typical; and (*c*) the postlegal, including the advent of Christ on earth and the whole of Christian history. To complete the scope of the federal theology, its ruling idea was projected back into eternity by the transcendental conception of a covenant between the persons of the Trinity, whose aim was the creation and redemption of man. This gave a series of three covenants, under which all history, divine and human, might be subsumed. It constituted a philosophy of history on the basis of an assumed divine plan. This threefold system is a later development from Koch's teaching.

The ideas of Koch and his school were distasteful to the orthodox Calvinists, for they shifted the emphasis away from predestination. Hence the federal theologians were always under suspicion, and sometimes were openly charged with heresy. Koch himself narrowly escaped condemnation. Their chief service to the advancement of Christian thought consists in having broken with scholastic Protestantism and, in fidelity to the genuine Reformation principle, having once more directed men's minds to the Scriptures themselves. They are not improperly represented as leaders in the study of what is now called biblical theology. Wits (Witsius) and Vitringa are justly honored as the foremost Old Testament scholars of their day. Consult: Cocceius, *Opera Omnia* (Amsterdam, 1673–75; 3d ed., 1701); Zoványi, *Geschichte des Coccejanismus* (Budapest, 1890); Fisher, *History of Christian Doctrine* (New York, 1896).

FED'ERATED MALAY STATES. A federation of native states, under British protection, spanning the Malay Peninsula between Kedah, Siam, Kelantan, and Trengganu on the north and Malacca and Johore on the south. The states, with their area, their population according to the 1911 census, and their administrative headquarters, are as follows:

	Sq. Miles	Pop., 1911	Head-quarters
Perak	7,800	494,057	Taiping *
Selangor	3,156	294,035	Kuala Lumpur
Negri Sembilan	2,550	130,199	Seremban
Pahang	14,000	118,708	Kuala Lipis †
The Federation	27,506	1,036,999	Kuala Lumpur

* The native capital is Kuala Kangsa.
† The native capital is Pekan.

The population included 420,840 Malays, 433,244 Chinese, 172,465 natives of India, 3284 Europeans and Americans, and 2649 Eurasians. Males numbered 725,062, and females 311,937, the great preponderance of the former being due to Chinese immigration. Total immigrants and emigrants in 1909 were 570,411 and 500,172 respectively; in 1910, 305,803 and 237,438. The country is generally fertile and well watered. Parts are mountainous; mountains on the east boundary of Perak exceed 7000 feet in height; in Selangor there are several peaks of over 5000 feet and one of 5812 feet; on the Pahang-Kelantan boundary Gunong Tahan reaches a height of 7186 feet and is probably the highest point in the Malay Peninsula, the second highest being Gunong Kerbau, on the Pahang-Perak boundary. The states produce coconuts, rubber, rice, sugar, tapioca, pepper, gambier, etc. The states have valuable mineral deposits, and their output of tin is the largest in the world. In 1910 imports and exports were valued, in Straits Settlements dollars (par value 56.776 cents), at 47,843,541 and 102,851,990 respectively; in 1911, 66,532,039 and 116,280,927. The export values of rubber, tin, and tin ore respectively were as follows in 1911: Perak, 10,994,087, 9,188,008, and 31,946,988 dollars respectively; Selangor, 23,852,273, 5,097,877, and 16,643,259; the Negri Sembilan, 5,039,968, 8517, and 2,741,591; Pahang, 28,319, 1,436,156, and 2,693,819. At the end of 1912 the Federated Malay States Railways had a mileage of 614 in operation (including 23 miles in Province Wellesley and 21 in Malacca). In addition 120 miles had been constructed and are worked in Johore by the company. The main line connects Prai, on the mainland opposite Penang, with Johore Bharu, opposite Singapore, and steam ferries at each end complete the connection between Penang and Singapore. There are several branch lines. The total revenue and expenditure of the states in 1910 were 26,553,018 and 23,598,610 dollars respectively; in 1911, 35,056,544 and 25,202,749. The British protectorate began in 1874, when, as a result of prevailing anarchy, especially in Perak, British residents were stationed in the states of Perak, Selangor, and Sungei Ujong (now one of the Negri Sembilan, "nine states"). The supreme authority in each state is vested in the state Council, which is presided over by the native sultan or ruler, who is assisted by the British Resident. In 1909 a federal council was created by an agreement between the British High Commissioner for the Malay States (who is also Governor of the Straits Settlements) and the four native rulers. The Council includes the High Commissioner, as president, the Chief Secretary, the sultans of Perak, Selangor, and Pahang, the yam tuan of the Negri Sembilan, the four British residents, and four unofficial members nominated by the High Commissioner. The Council, which meets at least once a year, considers the drafts of laws which are to apply to more than one state, and the annual estimates of the revenue and expenditure of the four states. Consult Swettenham, *British Malaya* (London, 1906).

FED'ERA'TION OF LABOR, AMERICAN. See LABOR, AMERICAN FEDERATION OF.

FEDERMANN, fā'dĕr-män, NIKOLAUS (1501–c.43). A German traveler in South America. He was born at Ulm, Swabia. In 1529 he was sent to Venezuela in command of an expedition of 129 Spanish soldiers and 24 miners in the employ of the Welsers, merchants of Augsburg, to whom the Emperor Charles V had granted Venezuela. Up to the year 1532 he was engaged in extensive explorations in the interior of that country, the results of which he published in the work entitled *Indianische Historia* (1557; Fr. trans. in the Ternaux-Compans collection, 1837). In 1537 he again visited Venezuela as the lieutenant of George of Speyer, then Governor-General, and entered upon a second expedition which brought him to New Granada. He was brave, but rapacious and cruel.

FEDERN, fā'dern, KARL (1868–). A German author and translater, born and educated in Vienna. In 1891–94 he practiced law, but thereafter devoted himself entirely to literature, living in Vienna, Berlin, London, and Italy, and writing on Italian literature, especially Dante, and on American and French literature. He published German versions of Emerson's *Essays* (1894) and *Representative Men* (1906), of Whitman's *Leaves of Grass* (1904), and of St. Evremond's works (1912); and he wrote *Essays zur amerikanischen Litteratur* (1899), *Dante* (1900), *Dante and his Time* (1902), *Essays zur vergleichenden Litteraturgeschichte* (1904), and several novels and romances.

FEDI, fā'dē, PIO (1815–92). An Italian sculptor. He was born at Viterbo and studied engraving at the Academy of Vienna; but after practicing this art for a short time he turned to sculpture, which he studied at the Florence Academy and in Rome, making his artistic début there with "Christ Healing the Sick." In 1846 he was employed by Leopold II, Duke of Tuscany, for whom he executed the statues of Niccola Pisano and Andrea Cesalpino (on the façade of the Uffizi), which are somewhat lacking in personality; and in 1852 he carved the funeral monument of the daughter of the Russian general Swov. His other works include the monument to the poet Nicolini in Santa Croce; the fine figure of "Sacred Poetry," in the Museo Civico, Verona; and his masterpiece—the "Rape of Polyxena," which was placed with the antique and Renaissance sculptures in the Loggia dei Lanzi in 1866. It is a group of four figures in the antique style, executed with great technical ability.

FEDORA, fā'dō'rä'. A popular play by Sardou, produced in 1882. The title character is among the rôles of Sarah Bernhardt.

FEDTCHENKO (also spelled FEDCHENKO), fĕd-chĕn'kō, ALEXEI PAVLOVITCH (1844–73). A Russian naturalist and traveler. He was born in Irkutsk, was educated at the University of Moscow, and in 1868–71 made a journey for study and exploration to Turkestan and the lower course of the Sir-Darya or Jaxartes. He made detailed investigation and maps of the Maghian district on this journey. In 1871 he accomplished a second journey to the desert of Kizil-Kum and to Khokan, proceeding to the western end of the Terek-Davan Pass. He was killed during an ascent of Mont Blanc. The scientific results of his expeditions were published in Russian at St. Petersburg (1873–76).

FEE, FIEF, or **FEUD** (AS. *feoh*, Goth. *faihu*, cattle, property; connected with Lat. *pecus*, Skt. *paśu*, cattle). In the feudal system of land tenure, a freehold estate in land, held of another and in subordination to certain paramount rights of the latter. These rights, taken together, constituted lordship of the land, while the interest of the subordinate owner was described by the term "freehold" (*liberum tenementum*), or tenancy. This relation of landlord and free tenant was the correlative of the personal relation of lord and vassal, upon which it was founded, and which it gradually superseded. The lord owed his vassal protection and justice, in return for which he exacted loyal allegiance, and the performance of certain services in accordance with the station and means of the vassal. In the course of time, when the lords became great landowners, these services came to be connected with the lands granted by them to their vassals, and then the lands were regarded as held by such and such services, and the different forms of freehold tenure were described by the service appropriate to each, as the tenure of knight's service, the tenure of grand sergeantry (or grand service: *magnum servitium*), the tenure of free and common socage (i.e., the service of socmen), etc. See FEUDALISM; TENURE.

Understood in this feudal sense—of lands held of a superior lord by some definite service or duty—the fee stands in contrast to the allodial or absolute ownership of land, free from any obligation of service or any relation of vassalage to a superior lord. It is doubtful how far this conception of absolute and independent ownership of lands was ever realized in practice in the Middle Ages; certainly there was none of it in England after the ascendancy of the feudal system had become complete. See ALLODIUM.

As the term "fee" stood for land held in any form of freehold tenure of a superior lord, it was originally applicable to such land, whatever the estate of the tenant might be. Probably the earliest fees were for the life of the tenant only, but the lord might and often did grant them to the tenant "and his heirs," in which case they became estates of inheritance. Before long, however, the term "fee" changed its meaning. As early as the thirteenth century it was commonly used in the sense of an inheritable estate, and this has continued to be its signification to the present day. It no longer denotes an estate held of another, as distinguished from an estate which owes no duty to any superior, but any estate, whether feudal or allodial, which is capable of transmission to the heirs of its owner. But its quality of heritability still depends in common-law jurisdictions on the use of words of inheritance in the instrument creating the estate. A gift to John Doe "absolutely and forever," or to him "and his assigns forever," will vest in him only a life estate, while a grant to one and his heirs will give him a fee. This technical rule has been abrogated by statute in most of the United States, and the more reasonable rule substituted that the intention of the grantor shall govern.

The right of freely alienating fees was not acquired until the quality of heritability had become definitely attached to them. It was finally established by the famous statute *Quia Emptores* (Stat. Westminster III, 1290), which granted and ordained that from thenceforth "it should be lawful to every freeman to sell at his own pleasure his lands and tenements or part of them," and at the same time provided that the feoffee, or person to whom the lands were conveyed, should hold them not of his seller, but "of the chief lord of the fee, by such service and customs as his feoffor held before." See FEOFFMENT; SUBINFEUDATION.

A fee with the qualities of general heritability and unlimited alienability is known as a fee simple (*feodum simplex*), and this is the form of estate commonly referred to when the term "fee" is employed without a qualifying adjective. Side by side with the fee simple, however, there has grown up an inferior kind of fee, with limited rights of inheritance and with restricted rights of alienation, known as a fee tail; but this is now, after 600 years of existence, dying out. See ESTATE; FEE SIMPLE; FEE TAIL.

In Scottish law the term "fee" is employed to describe the full right of proprietorship of lands, as contrasted with a life rent, which is the limited right of usufruct during life. A fee farm is land held by another in fee—i.e., in perpetuity by the tenant and his heirs, but subject to a perpetual rent, payable to the lord of whom the land is held. It was a common form of landholding in several of the American Colonies.

Consult the *Commentaries* of Blackstone and Kent; and Pollock and Maitland, *History of English Law* (2d ed., Boston, 1899); Digby, *History of the Law of Real Property* (5th ed., Oxford, 1897); Williams, *Principles of the Law of Real Property* (22d ed., Toronto, 1914).

FEEBLE-MINDED. See MENTAL DEFECTIVES.

FEEDING FARM ANIMALS. The proper and economical feeding of farm animals is receiving far more attention and is conducted in a much more intelligent manner than formerly. A generation ago stock was pastured during the summer, no grain was given during that season, and in winter hay and straw were fed with such corn or other grain as the farmer raised. While this practice still prevails over a part of the United States, the soiling system (see SOILING) is coming into extensive use, especially in the East, and greater attention is being paid to growing a variety of feeds for stock. Succulent feeds are now generally advocated for use with the dry feed, and the general adoption of the silo provides these, while furnishing the cheapest feed which can be produced on the average American farm. Roots are used to some extent to furnish succulent food, but their growth has increased but little in extent in the United States, although they are extensively grown for feeding in Great Britain. The increasing supply of by-products from oil and flour mills, starch and glucose factories, breweries, etc., has been accompanied by the extensive employment of these materials to supplement the coarser and less concentrated feeds grown on the farm; and the introduction and cultivation of different kinds of leguminous crops, such as clovers, soy bean, cowpea, alfalfa, etc., has increased the supply of protein, which is the most expensive of the nutrients.

Stock feeding is an art in which experience and judgment are very important elements of success. The aid of science has been invoked, and, as a result of investigations in animal physiology and the chemistry of nutrition, many of the scientific principles underlying the art have been worked out and formulated. These studies have shown that the animal body is composed mainly of four classes of substances—water, ash, fat, and nitrogenous materials—the proportions of each varying with the age of the animal, treatment, purpose for which it is kept, etc. These materials are being constantly broken down or consumed as a result of the life of the animal. To keep the animal in a healthy and vigorous condition there must be a constant supply of new material, i.e., food, and of the kind of food that furnishes the necessary nutrients. If an animal is growing, or producing milk, or performing heavy work, food is required in addition to that needed to supply the natural waste of the body. The principles of feeding animals rest upon replacement of the natural losses of the body and upon supplying the proper materials for making growth, milk, wool, etc. The various materials used as food for animals contain the same four constituents found in the body, viz., water, ash, fat, nitrogenous substances (protein), and in addition carbohydrates (sugar, starch, etc.), and fibre. Regarding their functions, it may be said, first, that food, when assimilated, is in part consumed to yield heat and energy for work and action, and in part stored up in the body for repair of the organs and as additional supply of fat, muscle, and other tissues. The sources of heat in the body and energy for work are supplied mainly by the fat and carbohydrates, and, under some conditions, by the protein. The value of fat as a heat producer is nearly two and a half times that of carbohydrates or protein. The sources of fat in the body are mainly the fat and carbohydrates of the food; the carbohydrates are not incorporated into the body as such, but are changed to fat. The exclusive source of protein, which is the essential constituent of blood, skin, muscle, tendon, nerve, hair, wool, casein of milk, etc., is the protein of the food. Hence the importance of supplying a liberal amount of protein in the food. The excess of protein may be worked over into fat, or it may be consumed by the body to yield body heat and energy for work. The fibre serves the same purpose as the carbohydrates, and the ash is used in the framework—the bones—and is also a constituent of the blood and other components of the body.

The needs of farm animals under different conditions of growth, work, and production have been studied in intricate experiments, and as a result the body requirements, in terms of digestible protein, fat, and carbohydrates, have been largely determined. These requirements have been formulated in the shape of so-called "feeding standards," which, while not absolute and inflexible measures of the body needs, are convenient and helpful indications of the amounts of nutrients required per day. The composition, fuel value, and digestibility of the principal feeding stuffs have been determined and are set forth in tables in convenient form for calculating ratios.

Abstract knowledge cannot take the place of experience in stock feeding, but it will prove of great value when combined with experience, enabling more intelligent practice, and giving a deeper insight and a wider range of vision. The agricultural experiment stations have worked out and tested a great variety of rations for different kinds of animals, and, from studies of the rations which were being fed by farmers, have been able to suggest modifications of them which, while more scientific, were also more economical and effective. It is impossible, in the space here available, to give rations or directions for feeding under the varied conditions which prevail in different localities. The kinds of feeding stuffs available and their cost, and the system of farming which is practiced, all have to be taken into account. Since the farmer usually has sufficient carbohydrate materials, he seeks to increase his supply of protein in the concentrated feeds he buys. The tables of composition will assist him in selecting these materials. In addition to the publications of the experiment stations, several excellent books have been written which treat the subject of feeding from both the scientific and the practical side. Consult: Armsby, *Manual of Cattle Feeding* (New York, 1890); Henry, *Feeds and Feeding* (Madison, Wis., 1910); "The Feeding of Farm Animals," in *United States Department of Agriculture, Farmers' Bulletin No. 22* (Washington, 1902); Jordan, *Feeding of Animals* (New York, 1903); Armsby, *The Principles of Animal Nutrition* (ib., 1903); H. P. Smith, *Profitable Stock Feeding* (Lincoln, 1906); O. Kellner, *The Scientific Feeding of Animals*, trans. by W. Goodwin (London, 1909); C. W. Burkett, *First Principles of Feeding Farm Animals* (New York, 1912). See Cattle; Dairying; Feeding Stuffs; Hogs; Sheep.

FEEDING STUFFS. A general term applied to all kinds of food materials used for farm animals, including so-called "fodder," "forage," and grain feeds. These materials are very diverse in character. They may be green, wet, or dry; the whole plant, as in the case of hay; only a part, as in the case of root crops; and the seeds of grains, or by-products from various manufactories. They are vegetable for the most part, although ground meat and bone and blood are used to some extent, especially in Europe, and the by-products from the dairy—skim milk, buttermilk, and whey—find extensive use for young animals. The number and variety of feeding stuffs have increased greatly in recent years. Formerly hay, corn fodder, straw, and the cereal grains constituted the main supply, but now the supply of home-grown and commercial feeding stuffs has become exceedingly varied, by the introduction and wide cultivation of a long list of field crops, such as millets, cowpea, field peas, soy bean, vetch, rape, alfalfa, sorghums, etc.; by the extensive production of brans from the flour mills, oil cakes from linseed and cottonseed-oil mills; and by numerous by-products from the manufacture of sugar, starch, breakfast foods, beer and malt liquors, which are prepared from corn and cereal grains. New kinds appear upon the market annually, and variations in the method of manufacture cause changes in the composition and character of the by-product.

Feeding stuffs may be classified in a general way as (1) coarse fodders, also called "roughage," or "roughness," including hays, straw, corn fodder, silage, and similar coarse materials, and (2) concentrated feeds, often referred to as grain feed or "concentrates," which include such materials as cereal grains, leguminous seeds, and the by-products mentioned above. These classes of feeding stuffs differ widely in composition, i.e., in the proportion in which the various nutrients are present. They all contain the same general groups of substances, viz., water, protein, fats, carbohydrates (starch, sugar, etc.), fibre, and ash. However dry a feeding stuff may be, it always contains a considerable amount of water, which can be driven off by heat. The amount may be only 10 or 15 pounds per 100 pounds of materials, as in the case of dry fodders, but in green fodders and silage it amounts to nearly 80 pounds, and in some root crops to 90 pounds per hundred. The rest of the material, which contains the nutrients, is dry matter, and since the water varies so widely feeding stuffs are often compared on the dry-matter basis. Protein is the name of a group of materials containing nitrogen; all other constituents are nonnitrogenous or nitrogen free. Albuminoids, the casein of milk, and lean meat are examples of protein. They are the "flesh formers" of the food. The fat includes, besides the real fats, wax, the green coloring matter of plants, and other materials extractable by ether; hence it is usually designated as crude fat. The carbohydrates likewise include a variety of materials, and from the manner of their determination are usually designated in analyses as "nitrogen-free extract." The fibre or cellulose is also of this class, but, as it is determined separately, is usually so stated. The ash is the incombustible part of the fodder—the part left when it is burned. It consists chiefly of lime, magnesia, potash, soda, iron, and phosphates, and is used largely in forming bone. These constituents, except the water, are called "nutrients," as they are the materials which nourish the body.

The protein is the most expensive nutrient, and the percentage of it largely determines the value of the more concentrated feeding stuffs. Another factor which influences the comparative value of feeding stuffs is the digestibility, or the proportions of the several nutrients which are digested by the animal. The digestibility varies widely in the case of different materials. In the case of corn meal, e.g., 68 per cent of the protein, 95 per cent of the nitrogen-free extract, and 92 per cent of the fat are digested, on an average; while in the case of wheat straw only about 23 per cent of the protein, 50 per cent of the nitrogen-free extract, and 35 per cent of the fat are digested. The undigested portions are of no use in the nutrition of the animal and are voided as manure. Tables of digestibility have been worked out, covering the more important feeds in general use. For these and further analyses of feeding stuffs, the reader is referred to compilations published by the United States Department of Agriculture.

The composition of feeding stuffs, or the proportion in which these nutrients are present, is determined by chemical analysis. A very large number of analyses of American feeding stuffs have been made, and while they show that the same kind of material varies in composition, depending upon the season, the stage of growth and other factors, the following table will serve to show the average composition of a number of the more important kinds:

AVERAGE COMPOSITION OF FEEDING STUFFS

	Water	Ash	Protein	Fibre	Nitrogen free extract	Fat
GREEN FODDER	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Corn fodder	79.3	1.2	1.8	5.0	12.2	0.5
Redtop	65.3	2.3	2.8	11.0	17.7	0.9
Timothy	61.6	2.1	3.1	11.8	20.2	1.2
Kentucky blue grass	65.1	2.8	4.1	9.1	17.6	1.3
Red clover	70.8	2.1	4.4	8.1	13.5	1.1
Alfalfa	71.8	2.7	4.8	7.4	12.3	1.0
Cowpea vines	83.6	1.7	2.4	4.8	7.1	0.4
Corn silage	79.1	1.4	1.7	6.0	11.0	0.8
ROOTS AND TUBERS						
Potatoes	78.9	1.0	2.1	0.6	17.3	0.1
Sugar beets	86.5	0.9	1.8	0.9	9.7	0.1
Mangel-wurzels	90.9	1.1	1.4	0.9	5.5	0.2
Turnips	90.5	0.8	1.1	1.2	6.2	0.2
Rutabagas	88.6	1.2	1.2	1.3	7.5	0.2
Carrots	88.6	1.0	1.1	1.3	7.6	0.4
HAY AND DRY, COARSE FODDER						
Corn fodder	42.2	2.7	4.5	14.3	34.7	1.6
Redtop hay	8.9	5.2	7.9	28.6	47.5	1.9
Timothy hay	13.2	4.4	5.9	29.0	45.9	2.5
Kentucky blue-grass hay	21.2	6.3	7.8	23.0	37.8	3.9
Mixed grasses	15.3	5.5	7.4	27.2	42.1	2.5
Red-clover hay	15.3	6.2	12.3	24.8	38.1	3.3
Mixed grasses and clover	12.9	5.5	10.1	27.6	41.3	2.6
Alfalfa hay	8.4	7.4	14.3	25.0	42.7	2.2
Cowpea hay	10.7	7.5	16.6	20.1	42.2	2.2
Wheat straw	9.6	4.2	3.4	38.1	43.4	1.3
Oat straw	9.2	5.1	4.0	37.0	42.4	2.3
Cottonseed hulls	11.1	2.8	4.2	46.3	33.4	2.2
GRAIN AND OTHER SEEDS						
Corn (maize) kernel	10.9	1.5	10.5	2.1	69.6	5.4
Barley	10.9	2.4	12.4	2.7	69.8	1.8
Oats	11.0	3.0	11.8	9.5	59.7	5.0
Rye	11.6	1.9	10.6	1.7	72.5	1.7
Wheat	10.5	1.8	11.9	1.8	71.9	2.1
Soy bean (seed)	10.8	4.7	34.0	4.8	28.8	16.9
Pea meal	10.5	2.6	20.2	14.4	51.1	1.2
BY-PRODUCTS						
Gluten meal	8.2	0.9	29.3	3.3	46.5	11.8
Gluten feed	7.8	1.1	24.0	5.3	51.2	10.6
Malt sprouts	10.2	5.7	23.2	10.7	48.5	1.7
Brewers' grains, dried	8.2	3.6	19.9	11.0	51.7	5.6
Wheat bran	11.9	5.8	15.4	9.0	53.9	4.0
Rye bran	11.6	3.6	14.7	3.5	63.8	2.8
Cottonseed meal	8.2	7.2	42.3	5.6	23.6	13.1
Linseed meal (new process)	10.1	5.8	33.2	9.5	38.4	3.0
Peanut meal	10.7	4.9	47.6	5.1	23.7	8.0

The large demand for the more concentrated feeds, especially the by-products, has led to adulteration with cheaper and inferior materials to some extent and to the use of names which may deceive the purchaser. Cottonseed meal, e.g., has been diluted with a quantity of ground cottonseed hulls and sold under the name of cottonseed feed, the mixture being greatly inferior to the meal. Furthermore, the by-products vary widely in composition, due to changes in the process of manufacture or to the separation of the germs from the rest, or to the addition of the hulls. These facts have suggested the desirability of legislation which shall require manufacturers to guarantee the percentage of protein, fat, etc., in their products, and which shall provide a feeding-stuff control, similar to that for fertilizers. Such laws have been passed in the New England and Central States and are rapidly spreading. They have afforded protection in the purchase of these materials. Similar protection is provided by the Fertilizer and Feeding Stuff Act of England and by a voluntary control in Germany. From time to time various mixed or "condimental" feeds are extensively advertised, with extravagant claims for their effect on the general health of animals or for their ability to increase milk production greatly. Tonic or medicinal properties are claimed for many of them. They often contain a considerable quantity of salt, and frequently a harmless quantity of fenugreek (q.v.), sulphur, gentian, ginger, and similar substances. None of them are concentrated feeds, in the common acceptance of the term; and Sir John Lawes many years ago showed condimental feeds to be of no advantage to healthy stock. They are usually sold in small packages, the price ranging from 10 to 20 cents a pound, which, from the standpoint of their feeding value, is exorbitant. In spite of this large quantities of these feeds are sold throughout the United States.

A new class of feeding stuffs has recently come into use in Europe and America, in which the molasses from sugar-beet factories is a prominent component. Various materials, such as palm-nut meal, bran, ground cornstalks, peat, and dried beet chips are used to absorb the molasses. Some of these molasses feeds have given surprisingly good results, and they appear to be relished by stock. Blood has been used to some extent in a similar way. See FEEDING FARM ANIMALS.

FEE′HAN, PATRICK AUGUSTINE A. (1829–1902). An American Roman Catholic archbishop. He was born in Tipperary, Ireland, and was educated at Maynooth College, Kildare. He came to the United States in 1852, settled in St. Louis, Mo., and became pastor of St. John's Church in that city. In 1854 he was appointed president of the Seminary of Carondelet and in 1859 pastor of the Church of the Immaculate Conception. He was consecrated Bishop of Nashville, where he showed his great ability as an organizer in completely reconstructing the diocese, which had become demoralized during the Civil War. With great obstacles to overcome, and with his work made more difficult by three successive epidemics of yellow fever, he made his diocese administratively one of the strongest in the country, and its educational institutions models for parochial schools in other dioceses. He founded the Catholic Knights of America, a lay organization which spread throughout the United States. In 1880 Bishop Feehan was installed as the first Archbishop of the newly created archiepiscopal see of Chicago.

FEEL′ING (AS. *fēlan*, OHG. *fuolen*, Ger. *fühlen*, to feel; ultimately connected with Lat. *palma*, Gk. παλάμη, *palamē*, palm of the hand, Skt. *pāṇi*, hand, AS., OS. *folm*, hand). A term whose variety of meaning has caused much confusion in psychology. It is used (1) for perceptions of touch: we say that a thing "feels" hard or soft or rough; and we "feel" for our matches in the dark or (metaphorically) "feel" our way in some delicate undertaking. This, the popular usage, would seem to be etymologically correct. It is, however, being discontinued in psychology. (2) The word is used for certain organic sensations of diffuse character, which are ordinarily tinged with strong affection: we speak of "feeling" hungry, thirsty, fatigued, etc. This usage approximates very closely to (6) below. (3) As touch is the primordial sense, from which all others have been developed, it is but natural that the term "feeling," the perception of touch, should be extended to embrace every mode of mental process. Feeling, in this sense, covers all sorts of mental elements and formations: sensations, affections, perceptions, ideas, emotions, actions, etc. It is being replaced by "mental process" (q.v.).

In modern psychology there is a well-marked tendency to restrict the term "feeling," to some kind of affective process. (See AFFECTION.) So we find (4) a classification of mental functions as those of the intellect, the feelings or sensibilities, and the will: feeling here including emotions, sentiments, moods, and feelings proper. We often say, too, that we "feel" sorry or glad or depressed; or that we "feel" the beauty of a landscape or the sublimity of a work of art. (5) Since this usage is unnecessarily wide, we find the meaning of the term restricted. Some authors make "feeling" the equivalent of the German *reines Gefuehl*, or pure feeling, *i.e.*, define it as affection is defined. (6) It is, however, better to regard feeling as a concrete process, compounded of sensation and affection, and lying in order of complexity next below the emotion (q.v.). It would then be correct to talk of the "feeling" of drowsiness or suffocation or ill health, since in all such cases we have a complex of sensations (for the most part organic) dominated by a pleasantness or unpleasantness. It would, again, be correct to speak of "feeling" hungry or thirsty or tired (see (2) above), provided that we had in mind the total consciousness of affectively toned organic sensations and not merely the sensations as such. Consult: James, *Principles of Psychology* (New York, 1890); Wundt, *Outlines of Psychology*, trans. by Judd (Leipzig, 1902); Titchener, *Text-Book of Psychology* (New York, 1910); Kuelpe, *Outlines of Psychology*, trans. by Titchener (London, 1909).

FEEN, DIE. The first opera of Wagner (q.v.), first produced at Munich, June 28, 1888.

FEER-HERZOG, fâr′hĕr′tsoG, KARL (1820–80). A Swiss statesman and political economist, born at Rixheim, Alsace. After 1852 he was a member of the Grand Council, of which he was twice elected president. From 1865 until his death he represented Switzerland in the Latin Monetary Union and in this capacity was an advocate of the gold standard. In 1867 he was director of the Swiss section of the Paris Exposition, and for more than 16 years he was president of the Financial Commission of Switzerland. His principal works are: *L'Unification monétaire internationale* (1869); *La France et ses alliés monétaires en présence de l'Unification universelle des monnaies* (1873); *Gold oder Silber?* (1874).

FEES. The compensation of lawyers, physicians, and certain public officials for their professional or official services. In England neither barristers nor physicians could recover their fees by legal proceedings against their clients or patients, except under a special contract. The ground of this rule was that such fees are regarded not as payment, but as an expression of gratitude for services the value of which cannot be expressed in money. The origin of the rule in the case of the advocates is traced to the relation which subsisted between the patron (*patronus*) and his client in ancient Rome. When the former appeared as the defender of the latter, he practiced, as Blackstone says (iii, 29), *gratis*, for honor merely, or at the most for the sake of gaining influence; and so, likewise, it is established in England that a counsel can maintain no action for his fees, which are given, not as *locatio vel conductio*, but as *quiddam honorarium;* not as a salary or hire, but as a mere gratuity, which a counselor cannot demand without doing wrong to his reputation. The rule at Rome was maintained even under the Emperors, and Tacitus mentions (*Ann.*, lib. ii, c. 5) that it was directed by a decree of the Senate that these *honoraria* should not in any case exceed 10,000 sesterces, or about $400. It has further been decided in England that no action lies to recover back a fee given to a barrister to argue a cause which he did not attend. But special pleaders, equity draftsmen, and conveyancers, who have taken out certificates to practice under the bar, and are not rated as counsel, may recover their reasonable charges for business done by them. As regards physicians, the rule that a fee could not be recovered by an action at law was applied in the case of Chorley *v.* Bolcot, in 1791 (4 T. R. 317). If, however, either a barrister or a physician acted under a special agreement or promise of a certain payment, then an action might be brought for the money. But all medical practitioners were relieved from the above code of honor by the Act of 21 and 22 Vict. c. 90, which applied to the United Kingdom and enabled them to recover in any court of law their reasonable charges as well as costs of medicines and medical appliances used. This rule applies to physicians, surgeons, and apothecaries as defined by the statute. Members of the inferior branches of both professions—attorneys, solicitors, etc., on the one hand, and surgeons, dentists, cuppers, and the like on the other—were always entitled to maintain an action for their fees. In Scotland the same rules prevail as in England with reference to both professions. In France, though the delicate sense of honor of the bar has always been preserved with quite as much care as in England, the rule is somewhat different. In law an action for the recovery of fees would be maintainable in that country by an advocate; but "in Paris the rule of the ancient bar, founded on the disinterestedness which was its characteristic and according to which any judicial demand of payment of fees was strictly forbidden under pain of erasure from the table [of advocates], has been religiously preserved." There is no law in the United States which puts contracts for services by lawyers or physicians on any different basis from contracts made by other persons. In most of the American States an attorney at law has a lien on the cause of action and on the papers in his hands for the costs of the suit, including his fees. (See ATTORNEY; BARRISTER; COSTS.) The practice of compensating sheriffs, jail keepers, and certain other officials by fees, which formerly prevailed generally in the United States, has fallen into disrepute and has been almost everywhere abandoned.

FEE SIMPLE (Lat. *feodum simplex*). A fee, or estate of inheritance, which has the qualities of general heritability and unlimited alienability. It is distinguished from the fee tail. See FEE TAIL.

A fee simple may be *absolute*, in which case it is unhampered by any condition or limitation whatsoever; or it may be *qualified*, or *limited*, as where it is to come to an end upon the happening of a definite event. The *conditional fee* of the early common law, out of which the fee tail has been developed, was a variety of the qualified or limited fee simple. It was a gift of lands to a man and his heirs, provided and so long as he should have heirs of his body. (See CONDITIONAL FEE; DONIS CONDITIONALIBUS, STATUTE DE.) Of this nature is a conveyance to A and his heirs so long as St. Paul's Church shall stand, or so long as the Republic shall endure, or until a certain charity shall be established.

But, though a fee simple may be made terminable by a limitation, as above described, it is not possible to deprive it of either of its principal incidents of alienability and heritability. No restriction upon either of these is valid, and a condition providing for a forfeiture on alienation or limiting the course of descent, will be wholly disregarded. The same is true of the only surviving feudal incident attaching to fees simple—that of escheat. This will take effect on failure of heirs, irrespective of any attempt to qualify or prevent it. Thus, a gift of lands to A and his heirs, with the proviso that on failure of heirs the property shall go to B, will vest an absolute fee simple in A, subject to the right of escheat, and the attempted gift to B will fail. See ESCHEAT; ESTATE.

As a fee simple is the largest estate that a man can have, falling short of absolute ownership only through the operation of the doctrine of tenure, and subject only to the dominant rights of the lord (usually the state) of whom the land is held, it was not possible at common law to grant any remainder or other future estate over after a fee simple. Under modern statutes, however, a fee simple terminable by a conditional event may be followed by another fee simple. See EXECUTORY DEVISE. Consult the authorities referred to under FEE.

FEE TAIL (ML. *feodum talliatum*, abbreviated fee). A fee, or estate of inheritance, in which the inheritance is restricted to the lineal descendants of the tenant. The right of inheritance, which is the principal characteristic of a fee, is not ordinarily capable of restriction, but the fee tail was devised for the express purpose of permitting such a restriction in a limited class of cases. Its object was to tie up estates and keep them in the family of the donor, and it achieved this end by giving effect to a conditional gift of lands to a person and the heirs of his body. This was originally known as a fee simple conditional and was construed to vest in the donee a conditional estate, which became absolutely subject to his disposition on birth of issue. As such power of disposition was inconsistent with the purposes of the gift, the celebrated statute *De Donis Conditionalibus* (Concerning Conditional Gifts) was passed in 1285 (stat. Westminster II) to restrict the power of the donee of such an estate and to protect the interests of the issue and of the persons to whom the estate was to go upon failure of issue. This it did by forbidding the alienation of the property by the tenant in tail.

For nearly 200 years after the passing of this act land settled in the form which it prescribed continued to be held under the fetters of a strict entail. But the tendency of the law, which in Scotland was to strengthen the power of entail, was in England in the opposite direction. For a long time tenants in tail, taking advantage of legal technicalities, were able practically to defeat the limitation in tail by means of a discontinuance. But it was not till the time of Edward IV that an effectual means of evading the provisions of the act was brought into use; this was achieved by means of a process called a *common recovery* (q.v.). By this process a tenant in tail could bar the entail and convert the estate into a fee simple. Another mode of barring an entail was by means of a fine (q.v.). It had been declared by the statute *De Donis* that levying a fine of lands should be no bar to the entail; but by 32 Hen. VIII, c. 36, it was enacted that a fine of lands, when duly levied, should be a complete bar to the tenant in tail and those claiming under him. It is to be observed that the operation of a fine was confined to those claiming under the tenant in tail; those who had rights of reversion or remainder under the grantor of the entail were not excluded by this species of assurance; so that by means of a recovery only could an estate tail be converted into a fee simple. From the introduction of common recoveries till the passing of the Fines and Recoveries Act (3 and 4 Wm. IV, c. 74), a period of more than 300 years, it was impossible that an estate could be held under the fetters of an entail if the tenant in tail and the next heir chose to combine to defeat the entail. By the Fines and Recoveries Act the technicalities formerly necessary in order to bar an entail were removed, and a tenant in tail may now by a simple conveyance alienate his estate at pleasure.

Estates tail are classified according to the form of the gift. If the limitation be to the heirs of the body of the tenant in tail without special qualification, it is a *fee tail general;* if it be to the heirs of the body of the tenant and his wife Joan, it is a *fee tail special;* if it be to the male heirs of the body, it is a *fee tail male.* So there may be fees tail special male, fees tail special female, etc. But the limitation must always be to the issue of the tenant in tail. As a fee tail is an abbreviated fee—a less estate, i.e., than a fee simple—it is, unlike the fee simple, capable of supporting a future estate by way of remainder or reversion. Thus, it is possible, even at common law, to make a conveyance of lands to A and the heirs of his body, with remainder, on failure of such heirs, to B.

Prior to the Revolution the English law of entails prevailed in the British Colonies in America. But, though it still exists in a few States, it has generally been abolished in the United States by statute—in Virginia as early as 1776 and in New York in 1782. In most States it is provided that an attempt to create a fee tail shall result in a fee simple. Consult the authorities cited under Fee.

FEHLING, fā'lĭng, Hermann (1811–85). A German chemist. He was born at Lübeck and was educated at Heidelberg. After being associated with the Liebig Laboratory at Giessen and studying for a time with Dumas at Paris, he was from 1839 to 1885 professor of chemistry at the Polytechnic Institute, Stuttgart. His most noteworthy researches were in the departments of analytical and industrial chemistry, his process for measuring the amount of glucose in substances being especially well known. (See Fehling's Solution.) He edited and published the new edition of the *Handwörterbuch der Chemie* by Liebig, Poggendorff, and Wöhler (1871 et seq.), and translated Payen's *Précis de chimie industrielle* into German (2d ed., 1852).

FEHLING'S SOLUTION (named from Hermann Fehling, who first introduced the solution into analytical practice). A deep-blue alkaline solution of cupric oxide used to detect the presence and determine the amount of sugar in a given mixture. The solution is best prepared, according to Soxhlet, by adding 34.6 grams of copper sulphate made up with water to 500 cubic centimeters, to a mixture of 60 grams of caustic soda and 173 grams of Rochelle salt (sodium-potassium tartrate) likewise made up to 500 cubic centimeters with water. It is still better to keep the two solutions in separate vessels and prepare Fehling's solution proper by mixing equal volumes of the two just before using, as Fehling's solution is liable to undergo decomposition. The simpler varieties of sugar reduce the cupric oxide (CuO) contained in this solution to cuprous oxide (Cu_2O), which is insoluble and has a bright-red color. Thus, one-half gram of dextrose added to 100 cubic centimeters of Fehling's solution prepared as described above would, on gentle warming, completely destroy the blue color of the solution and cause copper to precipitate in the form of cuprous oxide. Conversely, therefore, if a mixture is submitted to a chemist for examination and he is called upon to determine the amount of dextrose present in it, all he has to do is to determine carefully the volume of Fehling's solution that may be completely decolorized by the given mixture.

Ordinary cane sugar has no direct action on Fehling's solution. By fermentation, however, or by the action of dilute acids, it may be "inverted," i.e., split up into simpler varieties of sugar; and then, of course, it becomes capable of reducing Fehling's solution. Similarly Fehling's solution is not reduced by cellulose; but cellulose may be hydrolyzed by acids, and the resulting simple sugar will again reduce Fehling's solution. Among the disaccharides which, unlike cane sugar, do reduce Fehling's solution are maltose (malt sugar) and lactose (milk sugar). See Carbohydrates.

FEHMARN, fā'märn, or **FEMERN**, fā'mĕrn. An island in the Baltic Sea, belonging to the German Province of Schleswig-Holstein, separated from Holstein by a strait called the Fehmarn Sound, and from Laaland on the north by Fehmarn Belt (Map: Germany, D 1). It has an area of 71 square miles. The surface of the island is flat and but sparsely wooded; the soil is fruitful. Agriculture, stock raising, fisheries, and the making of stockings for exportation form the principal employments of the inhabitants. Fehmarn has a population of about 10,000. Its harbors are very shallow and can be navigated only by vessels of light draft. The chief towns are Burg, the capital, and Petersdorf. The island was transferred from Denmark to Prussia in 1866.

FEHMGERICHTE, fām'ge-rĭK'te. See Vehmgerichte.

FEHMIC (fā'mĭk) **COURTS**. See Vehmgerichte.

FEIA, fā'yȧ. A lake of Brazil, in the state of Rio de Janeiro, about 12 miles south of Campos, a short distance from the coast. It covers an area of about 190 square miles, but is very shallow; its waters teem with fish. It is connected by a canal with the Atlantic on the east and is in water communication with the Parahyba River on the north.

FEIJÓ, or **FEIJÓO**, fā-zhō', Diego Antonio (1784–1843). A Brazilian statesman. He was born at São Paulo, took holy orders in 1807, and was a priest in Parahyba, Campinas, and Itú. In 1822 he was appointed deputy to the Cortes at Lisbon, but resigned from that body with four other Brazilian deputies upon the declaration of Brazilian independence. As deputy and representative of the Liberal party (1823–33) he presented the bills proposing the reform of the municipalities and advocating the abolition of clerical celibacy, which he declared to be antisocial and antireligious. On July 4, 1831, he was appointed Minister of Justice and served until July 20, 1832. He was regent during the minority of Pedro II, from Oct. 12, 1835, to Sept. 18, 1837, during which time his liberal policy was bitterly attacked by the Conservatives. Because of this opposition he finally resigned. Later he was persecuted and exiled.

FEIJÓO Y MONTENEGRO, Benito Jerónimo. See Feyjóo y Montenegro, Benito Jerónimo.

FEILDEN, fēld'en, Henry Wemyss (1838–). An English naturalist and explorer.

He was educated at Cheltenham College and served in the British army in the Indian Mutiny and in 1860 in China. In 1862–65 he was assistant adjutant general in the American Confederate army, serving until the very end of the war in the Army of the Tennessee. In 1875–76 he was naturalist to the British polar expedition led by Nares and made valuable studies in Greenland, where a peninsula is named in his honor. He fought in the Boer wars of 1881 and 1899–1902 and in 1900 was made Companion of the Bath.

FEILDING, fēld′ĭng, Robert (*Beau Feilding*) (c.1651–1712). An English courtier. He commanded a regiment under James II, was a member of the Irish Parliament of 1689, was pardoned by William III in 1696, but upon his return to England passed a season in Newgate jail. He was convicted of bigamy in 1706, one of his wives being the Duchess of Cleveland. Swift, in "Mean and Great Figures" (*Works*, 1814), has intense scorn for him, and Steele described him in two *Tatler* papers (Nos. 50, 51, Aug. 4 and 6, 1709) as "Orlando the Fair." Lely painted a portrait of "handsome Feilding."

FEINT, fānt (Fr. *feinte*, sham, from *feindre*, to feign, from Lat. *fingere*, to fashion, Gk. *θιγγάνειν*, *thinganein*, to touch, Goth. *deigan*, to knead, Skt. *dih*, to smear). A military strategic or tactical device, designed usually to deceive an enemy or to cover a real design or purpose. See Attack; Tactics, Military; Demonstration; Battle; Strategy.

FEIS-CEOIL, fāsh′k′-yōl′ (Ir., assembly for music, from *feis*, assembly, and *ceoil*, gen. sing. of *ceol*, music). An Irish musical society founded at Dublin in 1897 for the advancement of music and for the purpose of giving a stimulus to musical studies in that country. It has an annual session at which prizes are distributed among the successful competitors. There are separate competitions for bands, choirs, vocal and instrumental soloists, and original compositions. It is specially designed to encourage native talent and is a very successful institution.

FEISI, fī′sē, or **FEIYASI**, Abul Feis ibn Mubarak (1547–95). A celebrated Indo-Persian poet and scholar, born in Agra. In 1572 he received an appointment as court poet to the Emperor Akbar. He wrote many lyrics, some epics (mostly unfinished), a commentary on the *Koran*, and translations from Sanskrit into Persian of the *Māhabhārata* and *Lilivati* as well as various mathematical and philosophical works. His Persian version of the well-known episode of Nala and Damayanti from the Bhārata under the title *Nal u Daman* is especially worthy of mention. In Max Müller's *Introduction to the Science of Religion* (New York, 1870) there are a number of metrical paraphrases of the poems of Feisi.

FEITH, fīt, Rhijnvis (1753–1824). A Dutch poet, dramatist, and romancer, of melancholy humor. He was born at Zwolle, where, after graduation at Leyden (1770), he became burgomaster in 1780 and published in 1783 the novel *Julia*, the Dutch *Werther*, steeped in romantic gloom. This he followed by tragedies, *Thirsa* (1784) and *The Patriots* (1785), and another Werther novel, *Ferdinand en Constantia* (1785), which made him the most popular poet of Holland, but provoked bitter criticism for their morbid sentimentality. He published a third tragedy, *Lady Jane Grey* (1791), and *The Grave* (1792), a didactic poem. Other tragedies and a didactic poem in six cantos on *Old Age* (1802), with five volumes of miscellaneous poems (1796–1814), and *Poems for Public Worship* (1804), complete his works, of which an edition (13 vols.) appeared in 1825.

FEJER, fĕ′yăr, György (1766–1851). A Hungarian author. He was born at Keszthely (Zala), and was educated at Pest and Pressburg. In 1808 he became professor, and in 1824 librarian, at the University of Pest. There he devoted the greater part of his life to the preparation of the *Codex Diplomaticus Hungariæ* (45 vols., 1829–44), which consists of documents relating to the history of Hungary from 104 to 1440 A.D. He wrote important historical and political works in his native language, one of which, on *Political Revolutions* (1850), was suppressed by the Austrian government.

FEJÉRVÁRY DE KOMLÓS-KERESZTES, fĕ′yăr-vá′rĭ de kôm′lōsh-kĕr′ĕs-tĕsh, Géza, Baron (1833–). A Hungarian statesman and general, born at Josefstadt. For his services at Solferino he was ennobled, in 1865 he was appointed major and aid-de-camp to the Emperor, and soon afterward he became secretary in the Ministry of National Defense. In 1883 he was advanced to the rank of lieutenant field marshal, then succeeding Raday as Hungarian Minister of National Defense, a post which he held under various premiers till 1903. He was an officer in the royal bodyguard in June, 1905, when he was made head of an extraparliamentary ministry to cope with the difficult situation created by the defeat of the Liberal Tisza cabinet and the refusal of the Coalition Opposition to take office. His ministry dissolved the Chamber and occupied the buildings of Parliament with soldiers. The Coalition then yielded, Fejérváry in April, 1906, resigned, and Wekerle formed a Coalition cabinet. See Hungary, *History*, and consult the sketch by Szalay (Pressburg, 1901).

FELANITX, fā′lá-nēch′, or Felaniche (ancient *Canati*). A town on the island of Majorca (q.v.), in the Province of Baleares, Spain (Map: Spain, G 3). It is situated in a valley surrounded by mountains and is well built, with a number of squares, one of which has a fountain. The municipal building and the parish church of San Miguel are among the more pretentious structures. On a neighboring hill is an old Moorish castle with subterranean vaults. Felanitx has some trade in agricultural products and wine and manufactures liquors, pottery, cloth, soap, lime, etc. Stock raising and fishing also are carried on. Puerto Colom, its port, has a safe but shallow harbor. Pop., 1900, 11,558; 1910, 11,223.

FELCH, Alpheus (1806–96). An American jurist, born in Maryland. He graduated at Bowdoin College in 1827 and removed to Michigan, where he served in the State Legislature in 1836–37, and in 1838–39 was one of the State Bank Commissioners, in which capacity he exposed many frauds under the banking law. He was judge of the Supreme Court of the State in 1842–45, and Governor in 1846–47; but before the expiration of his term he resigned to enter the Senate of the United States, in which he served six years (1847–53). He was then made president of the commission appointed to adjust the Spanish and Mexican land claims growing out of the provisions of the Treaty of Guadalupe-Hidalgo, and from 1879 to 1883 was professor of law in the University of Michigan.

FEL′DER, Cajetan, Baron (1814–94). An Austrian politician. He was born and educated at Vienna and in 1841 became lecturer on political history, statistics, and international law at the university there. As burgomaster of the city (1868–78), he introduced numerous reforms. In 1869 he became a member of the Upper House, and in 1878–84 was marshal of Lower Austria. He wrote *Die Gemeindeverwaltung der Reichshaupt- und Residenzstadt Wien* (2d ed., 1872; 2 additional vols., 1875–78), and some papers on entomology, especially the section on lepidoptera in *Reise der Fregatte Novara um die Erde* (1864–75).

FELDKIRCH, fĕlt′kĭrᴋ. A town of Vorarlberg, Austria, picturesquely situated about 1500 feet above sea level, in a rocky pass, which forms a natural fortress of great strength commanding the Vorarlberg pass, on the river Ill, near its junction with the Rhine (Map: Austria, A 3). It is 23 miles west-southwest of Bregenz. There are a handsome Rathaus, a Jesuit training college (Stella Matutina), a gymnasium, and a teachers' seminary. The town's industries include flour, woolen, and saw mills, dye works, and a bell foundry. Above Feldkirch rises the ruined castle of Schattenburg, once the seat of the counts of Montfort. Pop., 1900, 4617; 1910, 5057.

FELDSPAR, fĕl′spär (Ger. *Feldspath*, from *Feld*, field + *Spath*, MHG. *spât*, laminated stone; connected by popular etymology with *spar*). A group of minerals, all the species of which consist of silicate of aluminium in combination with one or more of the following metals: sodium, potassium, calcium, or barium. For many reasons the feldspars are considered the most important group of minerals in the large division of the silicates. The various species and their numerous varieties, all of which occur originally in igneous or metamorphic rocks, form an essential constituent of a number of rocks such as granite, syenite, gneiss, etc., which are of primary importance as building materials and are largely quarried in all parts of the world. As a group of minerals, the feldspars are in general characterized by a close agreement in crystal habit, prism angle, and methods of twinning, and especially by two easy cleavages inclined to one another at an angle close to 90°, the cleavage surfaces being smooth and of high polish. Their hardness is not quite that of quartz, and their specific gravity varies between 2.5 and 2.9, while their colors range from white, through pink, yellow, green, and red, to dark greenish brown. According to their crystalline form the different varieties are divided into monoclinic and triclinic feldspar, and under each of these heads they are grouped into species, according to their composition. *Orthoclase*, a potash feldspar, is a very common kind, occurring in monoclinic crystals of glassy, white, pink, and flesh-red color, in granite, gneiss, syenite, and many volcanic rocks. *Adularia*, or moonstone, is a white variety of orthoclase that, because of its pearly, opalescent reflections, is cut as a gem. *Microcline*, a triclinic potash feldspar, is the most common species of the group, being largely present in pegmatite veins. It has a green variety, amazon stone, found in granite at Pike's Peak, Colo., and in the Ural Mountains; this variety is also cut as a gem stone.

The plagioclase feldspars, embracing albite, oligoclase, andesine, labradorite, anorthite, and their several varieties, are soda-lime feldspars that vary in composition between the *albite*, which is high in soda and low in lime, and *anorthite*, which is low in soda and high in lime. Among the members of this group labradorite is the most important, as it forms a large part of the volcanic rocks of Pre-Cambrian age, such as those in the Adirondack region of New York and in many other similar localities of America and Europe. Some varieties of labradorite exhibit on the polished surface a beautiful play of iridescent colors and have on this account been employed to a considerable extent as ornamental stones.

All the feldspars weather readily under the action of both atmospheric agencies and acidulated surface waters and yield a form of clay known as kaolin, which is of great economic importance in the pottery industries. Unaltered feldspar, especially such as occurs in veins in granite and gneiss, is quarried, crushed, washed, and made into a paste that is applied to the surface of pottery to form the glaze. See Kaolin; Porcelain; Pottery; and the names of the different forms of feldspar mentioned above.

FÉLEGYHÁZA, fā′lāgsh-hä′zȧ, or **KISKUN-FÉLEGYHÁZA,** kĭsh′kōōn. A town in Hungary, about 65 miles southeast of Budapest (Map: Hungary, F 3). It manufactures bricks and cereals and trades in fruit, grain, wine, and tobacco. The surrounding country furnishes rich pastures, and cattle raising is an important industry. Its educational institutions include a trade school, a teachers' institute, and a gymnasium. Pop., 1900, 33,408; 1910, 34,924.

FÉLIBIEN, fā′lē′byăɴ′, André (1619–95). A French architect and historiographer. He was born at Chartres and was a protégé of Fouquet and Colbert. He became historiographer of buildings (1666), secretary of the Academy of Architecture (1671), and director of the Cabinet of Antiques (1673). He wrote a great number of works on architecture, painting, and sculpture, which, apart from their historical value, faithfully reflect the opinions of the Royal Academy, of which he was long the recognized exponent. Of these the following are the more important: *Origine de la peinture* (1660); *Entretiens sur les vies et sur les ouvrages des plus excellents peintres, anciens et modernes* (3 parts, 1666–1688); *Conférences de l'Académie de peinture* (1669); *Principes de l'architecture, de la sculpture, de la peinture, etc., avec un dictionnaire des termes propres* (1676–90).

FÉLIBRES, fā′lē′br′, Les. See Félibrige.

FÉLIBRIGE, fā′lē′brēzh′. An association founded at the Château of Fontségugne, near Avignon, on May 21, 1854, and organized in its present form at Avignon on May 21, 1876. Its purpose is stated in the first article of its constitution: "to bring together and to encourage those who by their writings preserve the language of the land of Oc, and also those scholars and artists who study and work in the interest of this region." The *langue d'oc*, so called because of the word for "yes" (*oc*), has never ceased to be spoken in a multitude of dialects all over the south of France, as it still is by some ten millions of persons. No literature of any real value or importance was written in Provençal from the middle of the fourteenth century to the beginning of the nineteenth, but the language never entirely died out as a written language. Joseph Roumanille (q.v.), born in 1818, at Saint-Remy near Avignon, first conceived the idea of purifying and perfecting the dialect of his own region. Surrounding himself with a few enthusiastic friends, he strove to systematize its grammar and orthography and, above all, to produce works of genuine poetic value that should speak to the hearts and souls of the humbler classes in the lower Rhone valley as no poems in French could ever do. He himself wrote several volumes of verse and in 1852 edited a collection of Provençal poems by various authors, called *Li Prouvençalo*.

These works form the starting point of a remarkable linguistic and literary revival, which, owing to the national exuberance of the southern French temperament, has not lost its impetus and still embodies the purest and noblest ideal of the race. The names of the seven poets who met at Fontségugne are Joseph Roumanille, Frédéric Mistral, Théodore Aubanel, Eugène Garcin, Anselme Mathieu, Paul Giéra, and Alphonse Tavan.

The word "Félibre" was furnished by Mistral (q.v.), who had found it in an old canticle, wherein Jesus is referred to as disputing with the seven *Félibres* of the law.

Besides the task of pruning and purifying the dialect, the Félibres had to create a public for their works. To this end they set about publishing an annual called the *Armana Prouvençau*, which began with an edition of a few hundred copies and has now reached a circulation of many thousands. In 1859 Mistral published his first long narrative poem, "Mirèio" ("Mireille"), which met with very great success, being praised in the most glowing terms by Lamartine, so that the Provençal Renaissance became known to the literary circles of Paris and soon to the world in general. From this time on the output of verse in Provençal steadily increased; scores, nay, hundreds of writers appeared, and to-day the bibliography of the Félibrean literature fills a large volume.

The movement speedily found adherents, not only in southern France, but even in Spain, where the Catalan poets established Floral Games in 1859 and were soon recognized as brothers by the Félibres. In 1867 the distinguished Catalan poet and patriot Victor Balaguer was received with enthusiasm at Avignon and elsewhere and on his return home sent the Félibres a silver cup, which has become the sacred emblem of the association. In the same spirit of Latin fraternity, the Félibres sent a delegation to take part in the Dante celebration at Florence (1890).

In 1876 the formal organization was effected. There is a consistory of 50 members, called Majoraux, which elects its own members; the consistory is presided over by the Capoulié. All the Félibres are divided into the four *Maintenances* of Provence, Languedoc, Aquitaine, and the Spanish Province of Catalonia. Any seven Félibres dwelling in one locality may ask the *Maintenance* to form them into a *School*. Every seven years floral games are held, when a poet is crowned laureate. He chooses the queen of the Félibrige, who is the living symbol of beauty for the Félibres, as was the lady of his choice for the troubadour in the days of courtly love.

The Capouliés have been: Mistral from 1876 to 1884, Joseph Roumanille from 1884 to 1891, Félix Gras from 1891 to 1901, and Pierre Devoluy.

The language used by Mistral and the Félibres is based upon the dialect of Saint-Remy. It is not the language of the troubadours any more than an Italian dialect spoken to-day in Lombardy is the language of Dante, though it belongs, of course, to the same general family. Furthermore, six centuries have elapsed since the days of the old poets, bringing great changes in the speech of the people. Mistral deliberately set to work to purify his dialect, casting out forms due to the influence of French, and to render the rustic speech of his home capable of literary expression. The result is a language exceedingly rich in vocabulary, full of terms expressive of what is exclusively Provençal. It is, however, an artificial, literary language that does not represent exactly the speech of any one, although readily understood by nearly all the inhabitants of the region. As the movement progressed, more and more writers claimed the privilege of writing in their own unaltered dialects. The Félibres of the *Limousin* advocate the general use of their dialect, because theirs is the original language of the ancient troubadours, while others claim that theirs is the most centrally located, since it is spoken around Montpellier in the heart of that district. Mistral, the greatest Provençal poet, favored the dialect used east of the Rhone.

But the language of the Félibres tends to prevail because of the sheer superiority of their literature. They count among their number one poet of very high rank, who has revealed the wonders and beauty of the land, the charm of its legends and history, the traits of its people, in verse of great originality and exquisite literary finish. Aubanel and Roumanille were real poets; Félix Gras wrote a number of long, ambitious poems, but succeeded best in the historical romance, and is possibly the best prose writer among the Félibres. Song writers and story-tellers abound. An astonishing number of magazines and periodicals bear witness to the ceaseless activity of these enthusiastic writers. One of its plays, *Lou pan dóu pecat*, by Théodore Aubanel (1829-86), was deemed worthy of being translated and produced at the Théâtre Libre under the direction of the famous Antoine (1878); and Daudet, that brilliant son and interpreter of southern France (though living in Paris), translated into Provençal his *Lettres de mon moulin*.

This modern literature in no way continues the literature of the troubadours. Mistral's first inspiration lay in his love of Homer and Vergil; he and his fellow poets were long indifferent to the troubadours, and even while extolling the glories of the past they have written for the Provence of to-day. Mistral at least succeeded in combining this modernism and localism with classic beauty of form, and it would be difficult to find an instance of a more thoroughly original and independent creation in the history of letters.

The only adequate history of the Félibrige is that of G. Jourdanne (Avignon, 1897). Mistral published a large dictionary, *Trésor dou Félibrige* (Aix, 1879-86); and there is a *Grammaire historique de la langue des Félibres* by Koschwitz (Griefswald, 1894). Consult also: Koschwitz, *Ueber die provenzalischen Feliber* (Berlin, 1894); H. Oddo, *La Provence, usages, coutumes, idiomes, depuis les origines* (Paris, 1902);

Armand Praviel and J. R. de Brousse, *L'Anthologie du Félibrige* (ib., 1909); Cecil Headlam, *Provence and Languedoc* (London, 1912).

FELICE, fā-lē'chā, FORTUNATO BARTOLOMMEO (1723–89). An Italian author, born in Rome, of a Neapolitan family. He studied at Rome and Naples under the Jesuits and in 1746 became a successful professor of physics at Naples after taking orders at Rome. He fell violently in love with a young Roman matron, the Countess Panzutti (whose husband had put her in a monastery), ran away with her, narrowly escaped capture at Lyons and Geneva, and was finally overtaken at Genoa. Felice was acquitted by the Italian ecclesiastical court, but felt that his career in the church was ruined; so he went to Bern, became a Protestant, and in 1762 established a famous press at Yverdon. He published the *Dizionario universale regionato delle umane cognizioni*, in 42 vols. (1770–75), with a *supplemento* in 6 vols. (1775–76); and 10 vols. of *Tavole* (1775–80), in which he had the collaboration of Euler, Dupuis, Lalande, Haller, and others. Among his other works are: *Sul modo di formare la mente ed il cuore dei fanciulli* (1763); *Principii del diritto della natura e delle genti* (1769); *Lezioni di logica* (1770); *Elementi del governo interiore di uno stato* (1781); *Quadro filosofico della religione cristiana* and *De Newtoniana Attractione, adversus Hambergerum* (1757).

FE'LICIS'SIMUS. The leader of a schism in the church at Carthage about the middle of the third century. Bishop Cyprian having withdrawn at the outbreak of the Decian persecution, the church was governed during his absence by the presbyters, among whom was one Novatus, who made Felicissimus his deacon. The records seem to show that Novatus ordained him, regardless of the rule that ordination must be only at the hands of bishops. Felicissimus and his sympathizers objected to the episcopal board of administration which Cyprian had appointed to visit the Carthaginian church in his absence; they were displeased with Cyprian himself on account of his retirement from the scene of action; and they were liberal in dealing with the lapsed (weak brethren, who had abjured their faith under pressure of persecution), readmitting them to the church on easy conditions, which was contrary to Cyprian's express commands. Felicissimus' conduct seemed to warrant his deposition, which Cyprian pronounced as early as 250 A.D. After his return from exile Cyprian convened an important synod at Carthage (251), which excommunicated the offending deacon. Felicissimus, however, had a considerable following. The schismatics completed their organization by the choice of Fortunatus as rival Bishop of Carthage, and Felicissimus visited Rome in the hope of winning sympathy from that important see. His mission was a failure, and Cyprian's vigorous measures of discipline in Carthage, together with the practical agreement as to the treatment of the lapsed, soon reached by Western Christendom, left the schismatics little hope of success. Felicissimus disappears from view, and his movement soon faded out of sight. Some writers find in this schism an effort after presbyterial church government, as against the episcopal system with which Cyprian's name is so prominently identified. Consult Benson, *Cyprian: His Life, his Times, his Work* (New York, 1897).

FELICITAS, fē-lĭs'ĭ-tās, SAINT. The name of two reputed Christian female martyrs. The first is said to have been beheaded at Rome, with her seven sons, under Antoninus Pius, about 150 A.D. The second was a slave who, with her mistress, Perpetua, suffered in the amphitheatre at Carthage under Septimius Severus in 202 or 203 A.D. Her day is March 7. The narrative is better attested than that of many of the early martyrdoms. Consult Harris and Gifford, *The Acts of the Martyrdom of Perpetua and Felicitas* (London, 1890), and Robinson, *The Passion of Perpetua* (Cambridge, 1891).

FE'LIDÆ (Neo-Lat. nom pl., from *felis*, cat). The cat family, distinguished primarily by possessing retractile claws. See CAT.

FE'LIX. The name of four popes and an antipope.—FELIX I (Pope, 269–274). His pontificate is interesting as an early example of the relations of the Christian Church to the Roman Empire and of the recognition by the state of the civil rights of Christians. In the pontificate of Felix's predecessor, Dionysius, Paul of Samosata, Bishop of Antioch, had been deposed by a council held in that city. Paul having resisted the sentence, the matter was laid before Felix, Dionysius being now dead; and, as Paul held possession of the church and church buildings, the bishops were obliged to claim the interference of the Emperor Aurelian, who was passing through Antioch on his return from Palmyra. Aurelian returned a decision to the effect that the buildings should belong to the person "to whom they should be adjudged by the bishops of Italy and Rome." Felix is, perhaps incorrectly, said to have suffered martyrdom in the persecution of the same Emperor, Aurelian, probably in 274. His day is May 30. Certain letters of a later date have been ascribed to him. —FELIX II (Pope from 355 to 358). He was chosen to occupy the Roman see after the banishment of Liberius. When the latter returned to Rome in 358, it is said that the Emperor Constantius proposed that Liberius and Felix should exercise jurisdiction jointly; but the Romans rejected the proposal, and Felix had to give way. He retired to his estate on the Aurelian Way, and, according to the *Liber Pontificalis*, died a martyr's death in 365. In the Roman Calendar he appears as saint and martyr, and his day is July 29, but he is excluded from the number of the popes.—FELIX III (Pope from 483 to 492). He was a native of Rome and of the family from which afterward sprang Pope Gregory the Great. His pontificate is memorable as presenting the true commencement of the disruption of the Greek and Roman churches. The contemporary occupant of the see of Constantinople, Acacius, as well as the Imperial court, were favorers of the Monophysite party, who refused to accept the decision of the Council of Chalcedon. (See MONOPHYSITES.) By their influence the Patriarch of Alexandria was deposed and replaced by the Monophysite Peter Mongus. The deposed Patriarch having appealed to Rome, Felix sent two legates to Constantinople to require his restoration; and the legates having failed in their trust, and Acacius still adhering to the heterodox party, Felix assembled a council at Rome, and excommunicated not only the offending legates, but also Acacius, the sentence being pinned by a monk upon the back of the Patriarch's robe while he was actually officiating in the church. Felix had previously rejected the *Henoticon*, or decree of union between the orthodox and the

Monophysites, published by the Emperor Zeno in 482. The schism thus inaugurated (484) was not healed till the year 519. The only literary remains of this pontiff are the letters and other acts of this controversy. He is a saint in the Roman Calendar, and his day is February 25.—Felix IV (Pope from 526 to 530). He was a native of Benevento. His pontificate presents no noteworthy event. He is also a saint in the Roman Calendar, and his day is January 30.—Felix V (Antipope from 1439 to 1449). He was Amadeus VIII, Duke of Savoy. He was born in 1383 and succeeded his father, Amadeus VII, as Count of Savoy in 1391. In 1416 Savoy was erected into a duchy. As a ruler, Amadeus was mild, just, and successful, and distinguished for his piety. In 1434 he resigned the rule to his son and retired to the hermitage of Ripaille, on the south bank of Lake Geneva. There he and some companions lived as hermits. He was nominated in the Council of Basel to succeed Eugenius IV (q.v.) in 1439 and elected on the fifth ballot, although it was objected to him that he had been married and had children, and that he was not an ecclesiastic and had no knowledge of theology or other fitness for the position. His election was not well received, and he so conspicuously failed to get recognition as Pope from the princes of Europe that he voluntarily resigned after a schismatical reign of 10 years. He was then rewarded by being made Cardinal Bishop of Basel, Lausanne, Constance, and Strassburg, and also Papal Vicar-General for all the states ruled by the house of Savoy. He died Jan. 7, 1451. Consult Pastor, *The History of the Popes*, vols. i, ii (London, 1899).

FELIX, Antonius. Roman procurator of Judæa (52–? A.D.). He was a younger brother of Pallas, the favorite of the Emperor Claudius, and, like his brother, evidently a freedman of Antonia, the mother of Claudius. Because of this fact, perhaps, he received the honor, unusual for freedmen, of military command as well as civic office. Of the earliest part of his public career little is known. His character has been painted by Tacitus in darkest colors, as that of a cruel, lustful, and unprincipled man, with the disposition of a slave, who thought that his influential friends at Rome would afford him such protection that he could commit all kinds of crime with impunity. He was thrice married—once to a granddaughter of M. Antony and Cleopatra; the third time to Drusilla, daughter of Herod Agrippa I and sister of Agrippa II, whom he persuaded to desert her husband, the King of Emesa. He succeeded Cumanus as procurator of Judæa in 52 A.D., and probably held the position till 58, although the latter date is disputed. Previous to this he may have been Governor of Galilee for a short time (so Tacitus). His appointment to the procuratorship of Judæa is said to have been at the suggestion of the high priest Jonathan, then in Rome in connection with the trial of Cumanus for misgovernment. His rule was marked by ceaseless disturbances and revolts, against which he acted with a severity that finally resulted in his recall to Rome. Most noted among the uprisings was that of the Zealots, his oppression of whom gave rise, or at least new impulse, to the fanatical Sicarii. (See Zealot.) The disturbance which occasioned his removal from office was the riot between the Jewish and Syrian inhabitants of Cæsarea, regarding the equality of their political privileges, in the quelling of which Felix acted with great cruelty but was unsuccessful, and the consideration of the case was removed to Rome, Felix being recalled before a decision was given. It was only through the influence of Pallas that Felix escaped punishment for his maladministration of his office. Nothing is known of his later career.

It was to Felix that Claudius Lysias, for reasons of safety, sent Paul from Jerusalem after his arrest in that city (56 A.D.), and it was before this procurator that the Apostle's first hearings were held. From these no decision was reached. Paul was remanded to prison, where he was kept, though under lenient regulations, through the remaining two years of Felix's term of service, his trial never being completed. There, also, for the sake of pleasing the Jews, with whom his relations were at that time specially strained, Paul was left by the procurator on his return to Rome (Acts xxiii. 23–xxiv. 27). See New Testament Chronology; Paul; Festus.

FELIX, Elise Rachel. See Rachel, Mlle.

FE′LIX, Marcus Minucius. A Roman lawyer and Christian, author of *Octavius*, a dialogue in defense of Christianity, probably the oldest Christian work extant in the Latin tongue. Nothing is known of the author. The date of the book is put about 160. It is in Migne, *Patrologia Latina*, iii, and in English translation in the *Ante-Nicene Fathers*, vol. iv (Buffalo, 1889).

FELIX, Saint, the Martyr. A Christian missionary of the third century. Regula, his sister and fellow martyr, and he are said to have been the first preachers of the gospel at Zurich, Switzerland. The legend is that they were executed by the Governor Decius at the order of the tyrant Maximian. Before the Reformation they were venerated as patrons of the city, on whose seal they appear with their severed heads in their hands. Their day is September 11. Consult *Mittheilungen der antiquarischen Gesellschaft zu Zürich*, vols. i and ii (1841).

FELIX HOLT, THE RADICAL. A well-known novel by George Eliot (1866).

FELIX′IANS. A Spanish sect of the latter part of the eighth century, so called from Felix, Bishop of Urgella. See Adoptian Controversy.

FE′LIXMAR′TE OF HYRCANIA, hẽr-kä′-nĭ-a. An old Spanish romance, chiefly notable as being among the works with which Don Quixote fostered his idealism before setting forth upon his adventures. The title character is a valiant knight who slays many giants.

FELIX OF VALOIS, vȧ′lwä′ (1127–1212). A cofounder of the Trinitarians (q.v.). He gave his goods to be sold for the poor and retired to a hermitage near Meaux. In 1198, accompanied by St. John of Matha, he obtained from Pope Innocent III the right to found the Order of the Trinitarians, which worked for the redemption of Christian captives from the Moors. Felix was canonized in 1666, and his feast is November 20.

FELL, John (1625–86). An English clergyman and educator, born at Longworth (Berkshire). He graduated at Christ Church, Oxford, in 1643, was a zealous Loyalist during the Commonwealth, and was appointed canon and then dean of Christ Church in 1660. From 1666 to 1668, and during a portion of 1669, he was vice chancellor of the university. He added several buildings to Christ Church and greatly improved its scholastic discipline. He also developed the press of the university and encouraged the collation of manuscripts and other scholarly undertakings. In 1684, by command of James II, he expelled from his studentship in Christ Church John Locke, whom he had publicly defended two years before. He became Bishop of Oxford in 1675. His publications include a critical edition (1682) of the works of Cyprian and a critical New Testament (1675); and he aided John Mill in his New Testament studies. He was the subject of a well-known epigram by Thomas Brown (q.v.), and he was bitterly criticized by Anthony à Wood, whose *History of Oxford* Fell published (1674) in a Latin version with notorious editorial changes, especially an attack on Hobbes.

FEL'LAH (pl. *Fellahin;* Ar. *fellāḥ*, laborer, from *falaḥa*, to till). One of the agricultural or laboring class of the people of the Nile valley. In Egypt there was a partial differentiation of the population in early times analogous to that which in India developed into caste (q.v.). This division was perhaps based at least in part on an original diversity or race, and the chief surviving classes are the Bedouin, who are the warlike and wandering people of the deserts, and the Fellahin, who comprise the peaceful and sedentary folk of the annually inundated bottom lands. In general, the Fellahin constitute the peasantry and the Bedouin the soldiery of Egypt; i.e., the distinction is industrial and social rather than ethnic—indeed, there are no constant ethnic differences. As a class, the Fellahin are docile and lacking in initiative, but they retain in form and feature the characteristics of their ancestors, the monument builders of ancient Egypt. The women are especially noted for their comeliness. See EGYPT, ETHNOLOGY.

FELLATAH. See FULAH.

FELLENBERG, fĕl'len-bĕrk, PHILIP EMANUEL VON (1771-1844). A Swiss agriculturist and educator. He was born in Bern and was educated at Tübingen. After a sojourn in Paris he settled in Bern, whence he was banished during the French invasion in 1798. Subsequently recalled, he was sent as Ambassador to Paris, where his services largely contributed to ameliorate the political conditions then prevailing in Switzerland. Later in life he devoted himself exclusively to the advancement of agriculture and the improvement of Swiss education through experiments on his estate at Hofwyl. In 1804 he established an orphan asylum, which began to be used only after he associated Wehrli with the work in 1808. In 1807 he founded the Literary Institute or Academy for children of the nobles and gentry. A colony for poor boys was established in 1816, and in 1827 a *real* intermediate school was opened for boys of the middle classes. Normal courses for the training of Swiss teachers were held during vacations. While Fellenberg aimed to provide an all-round education according to the needs of each class, he also hoped by associating all the classes together to bring about a feeling of sympathy and understanding between them. At Hofwyl more than 2000 pupils are said to have been taught. Endeavor was twice made to unite Fellenberg's establishments with those of Pestalozzi; but the two teachers were not sufficiently in harmony. The practical educational influence of Fellenberg upon his native land was, perhaps, even greater than that of Pestalozzi, while abroad Hofwyl was almost as well known as Yverdon. The manual-training movement in which many American institutions had their origin is probably due to Fellenberg's influence, while at least one well-known school with which Professor Tyndall was associated was established on similar lines in England. His literary activity was comparatively unimportant. Consult Hamm, *Fellenbergs Leben und Wirken* (Bern, 1845).

FEL'LING. A town in Durham Co., England, constituting an eastern suburb of Gateshead. It has manufactures of chemicals and glassware, and there are large collieries in the vicinity. Pop., 1901, 22,467; 1911, 25,026.

FELLOW COMMONER. A term applied formerly at Oxford, Cambridge, and Dublin universities to those undergraduates who were admitted to colleges by paying at a time when they were intended only for fellows and scholars on the foundation. The class of undergraduates had the privilege of dining at the fellows' table —whence the name, which for a time was superseded by the term "gentleman commoner." Both terms are now practically obsolete, Worcester College, Oxford, being the only instance where the term fellow commoner still appears, and Downing College, Cambridge, being the last which used the term until within recent years.

FEL'LOWS, SIR CHARLES (1799-1860). An English antiquarian, born at Nottingham. He early showed a fondness for travel and after 1832 spent a large part of his time in the Levant. In 1838 he began a series of journeys from Smyrna into parts of Asia Minor, at that time almost unknown to Europeans. His chief discoveries were in ancient Lycia, where he ascended the valley of the Patara, finding the ruins of Xanthus, the ancient capital, Tlos, and other sites, copying inscriptions, and making drawings of the architecture and sculpture. He then returned to England and published *A Journal Written during an Excursion in Asia Minor, by Charles Fellows* (London, 1839). In 1839 he again visited Lycia and discovered the ruins of no fewer than 13 cities, each of which contained works of art. Another work, entitled *An Account of Discoveries in Lycia, Being a Journal Kept during a Second Excursion in Asia Minor* (London, 1841), was the result of this journey. In 1841 an expedition left England for the purpose of selecting works of art from the ancient cities discovered by Fellows, who accompanied the expedition and directed its operations. Authorized by a firman from the Sultan, they made their selections and returned in the spring of 1842. Another expedition, under Fellows, sent out by the trustees of the British Museum, brought home 27 cases of marbles and casts in 1844. The sculptures, among which are the so-called Harpy and Nereid monuments from Xanthus, are now exhibited in the Lycian Room of the British Museum. In all his expeditions he paid his own expenses. In 1845 he was rewarded by the honor of knighthood. His other works are: *The Xanthian Marbles: Their Acquisition and Transmission to England* (1843); *An Account of the Ionic Trophy Monument Excavated at Xanthus* (1848); a reissue of his earlier journals under the title *Travels and Researches in Asia Minor, Particularly in the Province of Lycia* (1852); and *Coins of Ancient Lycia before the Reign of Alexander: with an Essay on the Relative Dates of the*

Lycian Monuments in the British Museum (1855).

FELLOW SERVANTS. A term used in the rule governing the liability of employers to their employees for injuries sustained by the latter in the course of their employment, to designate those who are employed by a common master in the promotion of a common enterprise, and whose relations are such as to make the safety of any one depend, in the ordinary and natural course of things, on the care and skill of the others. Accordingly an engine driver is a fellow servant of a switchman when they are serving a common employer in conducting a common business; while the seamen of one ocean steamer are not fellow servants of those of another steamer, although the vessels are owned by the same person. In the latter case the relations of the two crews are not such as to render the safety of one dependent, in the natural and ordinary course of things, upon the care and skill of the other.

Although the definition of fellow servant stated above is sustained by the English decisions, by those of our Federal courts, and by those of the great majority of our State tribunals, it has been rejected in a few jurisdictions. There the view has prevailed that the employees of a common master are not to be deemed fellow servants within the rule relating to employers' liability unless they are of equal rank. In these jurisdictions the conductor of a railway train, accordingly, is not the fellow servant of a brakeman; nor is the superintendent of a mill, nor the foreman of a gang of laborers, a fellow servant of those who are subject to his control. If a subordinate is injured through the negligence of his superior, the master is liable for such injury.

In the other class of jurisdictions the master is not liable unless the act is one which he is under an absolute legal duty to perform properly. This legal duty binds the employer to provide for his employees a safe place to work; to provide safe machinery and appliances; to formulate suitable rules and regulations for the safe conduct of his business, if such rules are needed; to warn his employees of danger which they could not or would not ordinarily discover; and to provide suitable superintendents and colaborers. If he delegates either of these duties to an employee, no matter what his grade or rank, the negligence or misconduct of the employee in the performance of that duty is in law the negligence or misconduct of the employer. For it he is liable to the injured servant. Perhaps it should be added that the negligent servant is liable to the person injured by his negligence, whether the latter is a fellow servant or not.

Consult: McKinney, *Treatise on the Law of Fellow-Servants* (Northport, 1890), and Bailey, *The Law of Master's Liability for Injuries to Servants* (St. Paul, 1894). See EMPLOYER'S LIABILITY.

FEL'LOWSHIP (from *fellow*, Icel. *fēlagi*, from *fēlag*, partnership, from *fē*, property, Eng. *fee* + *lag*, a laying together, AS. *lagu*, Eng. *law* + Eng. *-ship;* cf. Icel. *fēlagsskapr*, fellowship). An institution which arose in connection with the mediæval colleges, originally eleemosynary in their character. The members, or "fellows" (*socii*), as they are called, usually had a boarding place in common and received regular stipends provided for out of the income of the foundation. Such a college was established at the University of Bologna as early as 1267, and the beginning of the institution at the University of Paris is traced to a permanent though humble provision for sleeping accommodations and for small stipends to be given to 18 scholar clerks, the founder being a pious man, one Dominus Jocius of London. At Oxford a foundation was in 1243 established for two priests, who, while pursuing their studies, should say mass for the soul of their benefactor. In 1249 University College was founded with an income for the support of 10 or more masters of arts, who were studying theology. At Cambridge, St. Peter's College was founded in 1284. The recipients of these benefactions were usually required to pass certain examinations or to have attained a certain standard and often to show their need of such support. Frequently, however, the founder retained the patronage, which was restricted to his kin or to the members of a certain diocese or district. By the University Act of 1854 such restrictions were removed in England. At present the fellowships there are ordinarily confined to the graduates of the university to which the college belongs.

At Bologna the College of Spain still survives, having five or six students. The great Parisian endowments disappeared as a result of wars and revolutions. A fellowship in the Sorbonne is now merely an honorary distinction. In England the fellowships steadily increased in number and value for a time, but the tendency at present is to limit the emoluments and to require some research or other work from the holders. Today their income ranges from £200 to £300 per annum. To this is added the privilege of occupying certain apartments and in some cases of enjoying perquisites in meals or commons. The ordinary length of tenure of a fellowship is six or seven years; a few are tenable for life. In general they are forfeited should the holder attain to certain preferments in the Church or at the bar and sometimes in the case of his succeeding to property above a certain amount. Except by special vote of the college the holder of a fellowship forfeits it by marriage. The English fellows usually carry on instruction in their own colleges and are frequently professors in the university as well or hold other academic positions. In the newer English universities the fellowships are, as a rule, tenable for from one to three years, are rarely worth more than £150 a year, and require research work from the holder.

In the colleges and universities of the United States the term "fellow" often means trustee, as, in one sense, at Harvard. On the other hand, the ordinary fellowship is an honor bearing with it a certain annual stipend, which varies from $120 to $1500. The average amount is, however, about $500. The fellowships are bestowed according to merit and usually without restriction as to the collegiate institution of which the candidate is a graduate. The holder is expected to pursue graduate work in some special department to which the fellowship is attached, and in most cases this work is to be done at the institution which grants it. Occasionally, however, the fellow is allowed or even required to travel. Some institutions require certain services in connection with instruction from the holders of fellowships, others expect their time to be devoted to study. In 1911 there were 272 fellowships in 13 leading institutions of the country—California, Chicago, Clark, Columbia, Cornell, Harvard, Johns Hopkins, Michigan, Pennsylvania, Princeton, Virginia, Wisconsin, Yale—of a total value of $139,250.

Probably the most valuable fellowships are the Kahn traveling fellowships awarded in England, Germany, France, Russia, Japan, and America and of the annual value of $3000, for the purpose not so much of promoting academic research as international comity through a better understanding and appreciation of foreign conditions. For the current status of fellowships in various institutions, consult: *The Handbook of Graduate Clubs* (Chicago); *College Year-Book* (New York, 1896 et seq.); *Minerva Jahrbuch der Gelehrten Welt* (Strassburg, 1892 et seq.). See UNIVERSITY.

FELL'THAM, OWEN (c.1602–68). An English author. He was born in Suffolk and was connected with the household of the Earl of Thomond, at Great Billing, Northamptonshire. An enthusiastic Royalist, his boundless devotion, innocent of euphemistic intent, prompted him to call the dead Charles I "Christ the Second." His name has survived in literature as the author of a thoughtful and agreeable series of moral essays entitled *Resolves*, written "to hold himself and others within the limits of prudence, honor, and virtue" (1st ed., 100 essays, c.1620; 2d ed., 200 essays, 1628; 4th ed., 1631, reprinted by W. Pickering, London, 1846). He also wrote *A Brief Character of the Low Countries* (1652), which was incorporated with the eighth edition of the *Resolves*.

FE'LO DE SE (ML., traitor to himself). In criminal law, the technical description for a self-murderer, a suicide. As defined by Blackstone, "A *felo de se*, therefore, is he that deliberately puts an end to his own existence, or commits any unlawful act, the consequence of which is his own death" (*Comm.*, iv, 189). For legal consequence of self-murder, see SUICIDE.

FEL'ON (OF. *felon*, *felun*, *fellon*, Fr. *felon*, ML. *felo*, *fello*, wicked man, from OF. *fel*, It. *fello*, wicked, from Gael. *feallan*, Bret. *falloni*, teachery, Ir. *feal*, evil; connected with Lat. *fallere*, to deceive, Gk. *σφάλλειν*, *sphallein*, to fall, Skt. *phal*, to deceive, OHG. *fallan*, Ger. *fallen*, Icel. *falla*, AS. *feallan*, Eng. *fall*), or PARONYCHIA. A whitlow; properly, a painful inflammation (generally suppurative) around the nail or at the matrix or root of the nail. Commonly, however, the term is applied to a suppurative circumscribed inflammation anywhere on the fingers or thumbs. If superficial, the inflammatory process may undermine the epidermis only; if deep, it may burrow under the sheath of a tendon or under the periosteum. Pathologically felon is a cellulitis, and it is due, in people of reduced resistive power, to an injury, such as a puncture, cut, or scratch, followed by infection of the wound with pus germs. Pain is a prominent symptom, with tenderness on pressure, heat, throbbing, and much tension. If amelioration does not appear before pus is present, under treatment with rest, elevation, and applications of hot-water compresses, incisions must be made so as to release the exudate. Pus generally appears in 48 hours after infection. The incisions must generally be deep and occasionally multiple. A joint of the finger has been lost through delay after pus has appeared. To avoid contraction and stiffness as the cicatrix forms, the finger or hand must in some cases be supported on a splint.

FEL'ONY. In the common-law classification of crimes, the second in atrocity and in importance, the first being *treason*, and the one comprehending all minor offenses being *misdemeanors*. Omitting treason (which, though sometimes classed as a felony, really stands by itself in our legal system), the distinction between felonies and misdemeanors corresponds roughly to that between grave offenses and such as are less heinous in character. But the distinction is a purely artificial one. Our law has never made a classification of crimes which was based on their inherent nature, but has had reference in its divisions rather to the kind of punishment inflicted. A felony was any crime punishable by forfeiture of the criminal's lands, or goods, or both. Blackstone adds that capital or other punishment might be superadded to the forfeiture, according to the degree of guilt, and in England, for a long time, most felonies were punishable by death. But at common law forfeiture was always an essential part of the penalty, and punishment by death was never the true criterion. In England important statutory changes in the laws as to forfeiture (33 and 34 Vict., c. 23, 1870) have taken away the practical utility of the former test of a felony. But those crimes are still held to be felonies and misdemeanors respectively which were so when the test was operative. Many crimes have been expressly declared felonies by the statutes creating them. Even in the absence of such declaration all crimes for which by statute the penalty of death may be decreed are there held to be felonies. In some of the United States the distinction between felonies and misdemeanors is practically discarded, the punishment for each particular crime being prescribed by statute, and the word "felony," if used at all, being employed in a loose and indefinite sense. In other States the distinction is retained by statute and made to depend on the kind of punishment. Thus, in a considerable number, statutes have declared that crimes punishable by death or by imprisonment in the State prison shall be felonious. In those States it is sufficient to constitute felony that those penalties *may* be imposed, though the court or jury may be given power to inflict a less severe punishment or to suspend sentence. See CRIME; INFAMOUS CRIME.

FELS, fĕlz, JOSEPH (1854–1914). An American manufacturer and single-tax advocate, born at Halifax Court House, Va. After four years as a traveling salesman for manufacturers of soap he undertook in 1874 the manufacture of this commodity at Baltimore with his father, under the firm name of Fels & Co. Later the business was transferred to Philadelphia. Having amassed a great fortune, Fels became an ardent advocate of single-tax reforms, for the promotion of which he established the Joseph Fels Fund of America; to this he contributed $125,000, and to similar funds in Denmark, Germany, France, Spain, Australia, New Zealand, and Canada he subscribed generously. He also introduced profit sharing in his factories, backed single-tax colonies near Mobile, Ala., and Arden, Del., and established a labor colony at Hollesley Bay, England. As a lecturer and as a magazine contributor, he promoted the single-tax propaganda by his personal efforts.

FELSINA. See Bologna, *History*.

FELSING, fĕl′zĭng, George Jakob (1802–83). A German engraver, born at Darmstadt. He studied under his father, Johann Konrad Felsing, and under Giuseppe Longhi at the Academy of Milan, where he won the first prize in 1828 with his "Christ on the Mount of Olives," after Carlo Dolci. He was later influenced by Raphael Morghen and was noted for the accuracy with which he produced the peculiar characteristics of paintings which he engraved, particularly those of the Düsseldorf school. Among his finest engravings may be mentioned: Correggio's "Marriage of St. Catharine"; Raphael's "Violin Player"; Overbeck's "Holy Family"; "Salvator Mundi" (after Da Vinci); "Hagar and Ishmael" (after Köhler); "Jeremiah on the Ruins of Jerusalem" (after Bendemann); "Christ Taken Prisoner" (after Hofmann); and "Poetry and Love" (after Kaulbach). He was an honorary member of the academies of Milan and Florence and of the French Institute.

FELS′ITE (from Ger. *Fels*, rock). A name applied to the dense igneous rocks which have a stony texture with a fairly light color, and which require the use of the microscope to determine their mineral nature. It is a convenient general term for the classification of rocks in the field and is now used as such, although it was formerly applied in a more restricted sense to the fine-grained equivalents of the quartz porphyries. According to present usage felsite may mean any of the dense volcanic or dike rocks which correspond to granite, syenite, or diorite among the coarsely crystallized class. Thus, basalts and diabases are not included. If a felsite contains scattered crystals of recognizable minerals (phenocrysts), it is known as a felsite porphyry, or leucophyre. Felsites occur in the form of dikes, sheets, and as surface lava flows, the latter often covering many hundreds of square miles. They are found along the Appalachians from Maine southward, also in the Rocky Mountain and Coast ranges, and elsewhere in regions of volcanic activity.

FELT (OHG. *filz*, Ger. *Filz*, OChurch Slav. *plŭstĭ*, felt; probably connected with OHG. *falz*, Ger. *Falz*, fold). A fabric formed without weaving by taking advantage of the natural tendency of the fibres of hair and wool to interlace with and cling to each other. As to the origin of the knowledge of felt making, its beginnings antedate by many centuries the Christian era, and the fabric is mentioned by the earliest writers. In fact, St. Clement is the patron saint of the felt makers, since he was said to have put carded wool between his feet and the soles of his sandals at the beginning of a journey and found it transformed into cloth at its end. On account of greater simplicity of its structure, it is probable that felt was made long before the art of producing cloth by spinning and weaving had been discovered.

The felting quality of fibres of hair or wool results from their structure. When examined by the microscope, the hair of all animals is found to be more or less jagged or notched on its surface; in some animals it is distinctly barbed; and this structure is so directed that the teeth or barbs all point towards the tip of the hair. If a piece of human hair (in which this structure is less marked than in most animals) be held between the finger and thumb, and rubbed in the direction of its length, it will invariably move between the fingers in the direction of its root; for the skin, while moving towards the tip of the hair, slides freely upon it, but, moving in the other direction, against the inclination of the barbs, it brings the hair with it. It will be easily understood that when a number of hairs are pressed together those which lie in opposite directions to each other and in contact will interlock at these barbs or teeth and thus resist any effort to tear them asunder. When once this close contact and interlocking is established between any two or more hairs, they remain attached, but the others that are differently arranged, or not in contact, will still be free to move upon each other; and therefore, if subjected to continual blows, pushing, and pressure, the unattached hairs will be continually shifting until they reach others in suitable positions for clinging together, either by crossing obliquely or by lying in the same line and overlapping at their ends or any other portion. When the hair has a natural tendency to curl, the felting is still more readily brought about by the additional interlacing. Although the felting property is possessed in a preëminent degree by wool, it belongs to the hair or fur of other animals, including the goat, ox, hare, rabbit, and beaver.

The first mechanical process for the production of felt was invented by J. R. Williams, an American, about 1820. Many patents have since been taken out for the various details of felting machinery, but the main principle is the same in all. The wool is carded more or less perfectly into laps of the length and breadth of the web to be made. One layer of these laps is placed upon another to secure the desired thickness of the fabric, and the two outside layers are often of a finer quality than the interior. The bulky sheet is now passed between rollers which are partly immersed in water, and some of them are heated internally with steam. The material is subjected to a beating and oscillatory motion as well as to pressure. The completed fabric is dyed and finished like ordinary cloth. The details of manufacture were at one time strictly guarded trade secrets, each factory having its own processes and specially made machinery.

Felt is used for many purposes. It is employed as a covering for floors and as an upholsterer's material. It is made up not only into hats, but into cloaks and other garments. Carriage linings, polishing cloths, pianoforte hammers, surgical dressings, and many other objects requiring a soft, thick cloth are made from felt. The felt used for women's hats is cut from the piece, but that employed in the manufacture of men's hats is made in special shapes. The material used for men's hats is usually the fur of raccoons, beavers, or rabbits, mixed with some good felting wool. See Hats.

Various fabrics which are technically known as felt, and which possess in greater or less degree the qualities of this material, are manufactured for use in different industries. In these coarse grades of felt cow's hair is often an important ingredient. The felted sheathing used as a nonconducting covering for retaining the heat of steam boilers is a substance intermediate between felt and paper. It is made from woolen refuse and other cheap materials reduced to pulp, beaten and dried. *Lining* and *roofing felts* are used in the construction of buildings and act as nonconductors of heat and sometimes of moisture and sound. Such felts are made chiefly from coarse animal fibres, such as cow's hair, with varying proportions of mill waste, and incorporated with pitch or asphalt.

The *asbestos lining* and *roofing felt* is made of pure asbestos, saturated with asphalt, the body fibre in certain brands containing no organic matter. The process of manufacture is similar to that employed in making paper. *Paper-maker's felt* is not a true felt, but a coarse, loosely woven material which has been neither teaseled nor spun. Little detailed information regarding the manufacture of felt appears to be available in printed form, and such references as can be found are scanty and, for the most part, were written long ago. An interesting chapter on "Felt and Felting" will be found in Murphy, *The Textile Industries*, vol. ii (London, 1912).

Statistics. According to the thirteenth census of the United States, there were in the country, at the end of 1909, 43 establishments devoted to the manufacture of felt goods, producing goods valued at $11,852,626. The principal products were felt cloths, boot and shoe linings, upholstery felts, trimmings and lining felts, felt shirts, and endless belts for paper manufacture.

FELT, Joseph Barlow (1789–1869). An American antiquarian. He was born at Salem, Mass., and graduated at Dartmouth in 1813. After holding pastorates in the Congregationalist Church at Sharon, Mass. (1821–24), and Hamilton, Mass. (1825–34), he was commissioned by Gov. Edward Everett in 1836 to arrange the Colonial and early State papers of Massachusetts. At this work he continued for 10 years. He was librarian of the Massachusetts Historical Society (1842–58), president of the New England Historic-Genealogical Society (1850–53), and recording secretary of the American Statistical Association (1839–59). He was the author of the following works on New England history: *Annals of Salem* (1827; 2d ed., 2 vols., 1845–49); *History of Ipswich, Essex, and Hamilton* (1833); *The Customs of New England* (1834); *Historical Accounts of Massachusetts Currency* (1839); *Ecclesiastical History of New England* (2 vols., 1855–62); and several other genealogical and biographical works.

FEL'TON, Cornelius Conway (1807–62). An American classical scholar, born at West Newbury, Mass. He graduated at Harvard in 1827 and taught first at Geneseo, N. Y., 1827–29. In the latter year he was appointed tutor in Latin at Harvard; in 1830, tutor in Greek; in 1832 he became university professor, and two years later Eliot professor of Greek literature; in February, 1860, he was made president. Among his publications were: *Homer: with English Notes and Flaxman's Illustrations* (1833), a valuable work; *Munzel's German Literature* (1840); *Clouds and Birds of Aristophanes; Ancient Literature and Art; Poets and Poetry of Europe; Panegyrics of Isocrates; The Agamemnon of Æschylus: Classical Studies* (1843); *Guyot's Earth and Man* (1849). In 1853–54 he made a European tour and in 1855 he revised for publication Smith's *History of Greece*, with an edition of Lord Carlisle's *Diary in Turkish and Greek Waters*. A selection from modern Greek writers was published by him in 1856. Other works of his were: "Life of General Eaton," in Sparks's *American Biography; Addresses;* and contributions to the *North American Review*. Consult *Proceedings of the Massachusetts Historical Society* (Boston, 1866).

FELTON, John (c.1595–1628). The assassin of the Duke of Buckingham, the favorite of Charles I. He was descended from an old Suffolk family and entered the army at an early age. Of a sullen and churlish disposition, he was generally disliked, and his applications for promotion were disregarded. He felt that he had a special grievance against Buckingham, who had personally refused his petitions, and after reading the declaration of the House of Commons that the Duke was a public enemy, he stabbed him, at Portsmouth, Aug. 23, 1628. The crime was popular with the army and navy and with the people of England generally, as numerous poems and songs were written in Felton's praise. He was tried on November 27, pleaded guilty, and was hanged at Tyburn the next day.

FELTON, Samuel Morse (1853–). An American railroad president, born in Philadelphia. He was educated at Massachusetts Institute of Technology. Beginning railroad work as a rodman in 1868, he rose rapidly, becoming chief engineer, general superintendent, and general manager of various railroad lines between 1873 and 1885. He was vice president of the Erie (1885–90), the Memphis and Charleston, the Mobile and Birmingham (1891–93), and the Knoxville and Ohio (1891–92) railroads, and president of the Louisville Southern and the Alabama Great Southern (1891–93), the Cincinnati, New Orleans, and Texas Pacific (1890–99), the Chicago and Alton (1899–1907), and the Mexican Central (1907–09). He was also receiver of the Columbus, Sandusky, and Hocking Railway in 1897–99 and the Kentucky and Indiana Bridge Company from 1893 to 1900. In 1909 he became president of the Chicago Great Western Railroad, and in 1912 he was elected president of the Pere Marquette Railroad.

FELTRE, fĕl'trȧ (Lat. *Feltria*). A city in the Province of Belluno, north Italy, 850 feet above sea level, and 34 miles northwest of Venice (Map: Italy, D 1). The bishopric was united in 1819 to that of Belluno. Feltre has a Venetian Gothic palace with fine mural paintings, a beautiful cathedral, a seminary, a gymnasium, an industrial school, a hospital, an orphan asylum, and a municipal pawnshop, established in the fifteenth century. It is a market for silk, wine, and oil, spins silk and bleaches wax, and makes baskets and ironware. In 1809 Napoleon gave Marshal Clarke the title of Duke of Feltre. To Pamfilo Castaldi, as the discoverer of the art of printing and as a native of the town, a monument was erected in Feltre in 1868. Pop. (commune), 1901, 15,243; 1911, 15,465.

FELTRE, Morto da. See Morto da Feltre.

FELUC'CA (It., from Ar. *falūka*, *fulk*, ship, from *falaka*, to be round). A small, fast-sailing vessel, formerly much used in the Mediterranean and still common there as a coasting or fishing vessel. It has usually two masts, each carrying a lateen sail, and is also fitted with 8 to 16 oars. Feluccas are not ordinarily decked over, but a small shelter is sometimes built aft.

FEMALE QUIXOTE, The. A satirical romance by Charlotte Lennox (1752), written in ridicule of the artificial fiction of Gomberville and Scudéry.

FEME COVERTE, fĕm, *or* fām, kŭv'ērt (OF., protected woman). The common-law term for a married woman, having reference to her legal status. The corresponding status of an unmarried woman was indicated by her legal description as a *feme sole*. When the *feme sole* married, she was said to be under *coverture*, which signified that her legal personality had for many purposes become merged in that of her husband. These terms have lost their significance in those jurisdictions in which married women have been invested with the full legal rights and responsibilities of unmarried women. The legal status of the *feme coverte* will be considered under the title HUSBAND AND WIFE. See also MARRIAGE; WOMAN.

FEMERN. See FEHMARN.

FEMINISM (from Fr. *féminisme*, from Lat. *femina*, woman). Feminism is a term which originated in France about 1890 and has been used increasingly in English during the last 20 years to describe the body of ideas and motives which lie at the root of the modern woman movement. Feminism as a social theory stands for the complete emancipation of woman, economic, political, social, and personal. It would elevate her from a condition of inferiority and perpetual minority similar to that of children to a position of full equality with men, in which she would find open to her every opportunity without distinction of sex. Feminism, its supporters take care to emphasize, is thus merely humanism. It signifies the emergence of woman as a human individual with the same rights and the same duties as all others of the species. Emancipation, the struggle for freedom from the trammels of custom and law, is, however, only one side of the feminist movement. Freedom cannot come without responsibility, and the feminist realizes that with her bonds she is casting away also her privileges. Her plea is for no discrimination, favorable or unfavorable, for the right to share with man all the activities of modern civilization. This movement is no recent upgrowth, no upstart radicalism of the last decade, but is the natural accompaniment of the whole transformation of thought, on the one hand, and of the economic basis of society, on the other, which distinguishes the last two centuries from the rest of human history. To understand feminist thought one must therefore comprehend its historical development and its sociological implications.

The modern feminist movement traces its origin to the same forces which gave birth to the modern idea of democracy—to the forces which brought about the great French Revolution, the American Revolution, and the transformation of England from a feudal aristocracy to an industrial democracy. These forces, which gathered power towards the end of the eighteenth century, sprang partly from the unconscious economic transformation of society which involved the breakdown of the feudal system and the growth of a new industrial organization, and partly from a conscious intellectual current which took its rise from the great French philosophers of the eighteenth century, Voltaire, Rousseau, Montesquieu, and others, the general tendency of whose thought may be summarized in the watchwords of the democratic movement: liberty, equality, and fraternity.

The new reliance on the efficacy of the human reason as against the weight of tradition and authority, the discovery of the enormous influence of environment in determining character, combined with a romantic feeling for the majesty of simple humanity and the claims of the individual against tyrannous external influences, created a new confidence in the possibilities of human development and led to the enunciation of the doctrine of natural rights. It was not until the eighteenth century that these ideas were applied to men in general, and then only after long and bloody struggles with the conservative and aristocratic forces of the past. This period thus gave birth not only to a women's movement, but more immediately to a men's movement, or, rather, to a human movement of which men were able for various reasons to reap the advantage more swiftly than women, but, say the feminists, no more surely. Feminism is thus merely one aspect of modern humanism and has developed into a special movement merely because it had special obstacles to overcome and not because of any difference in its final aims. For both the men's and the women's movements these aims are still those of the French Revolution interpreted in the light of contemporary conditions: *liberty* for the individual in so far as it does not encroach upon the liberty of others; *equality* of opportunity for all alike, rich and poor, man and woman; *fraternity*, the spirit of comradeship, coöperation, and brotherly love as a basis for social solidarity.

Since, then, modern humanism, or the "discovery of man as man," makes its appearance only in the eighteenth century, it is not surprising that there are few traces before that period of feminism, which may be called the discovery of woman as man. But these traces appear in precisely the periods in which the estimation of the human personality and the general level of culture were high. In the Greece of the third and fourth centuries B.C. which developed the highest ideals of personality to be found in the ancient world, the position of one class of women at least, the *hetairai*, was very favorable. They mingled freely with the men in public gatherings and shared to a great extent their high intellectual culture, privileges which were forbidden to the respectable women, who lived a secluded harem-like life. In this period, too, Plato in his *Republic* first advanced the idea of the complete social and political equality of the sexes. He based his claim upon the proposition that, so far as mental and moral qualities were concerned, there was no qualitative difference between the sexes. The sexes are to coöperate in the ideal state in all their activities and in their gymnastic and musical education as well as in their study of science and art.

At the time of the Renaissance also there are certain anticipations of modern feminism. The otherworldliness of early Christianity, with its denunciation of the joys of the flesh and of woman as their incarnation, had not been favorable to woman's development; but the revival of pagan feeling at this period, the unabashed joy in beauty and life, lifted the ban. In the new feeling of individuality, in the new interest in art and literature, in the new consciousness of personality, women shared with men. They were educated with great care, appeared in public in Italy and Spain as artists, poets, and orators, and gathered about themselves at their courts the talent and learning of the time. But this was a purely individualistic and aristocratic development and not, like the feminism of modern times, democratic and social.

One of the earliest feminist works was produced in the fifteenth century by Christine de Pisan, the French poetess, who made a plea in her *Cité des dames* for the emancipation of woman. Somewhat later Mademoiselle de Gournay, the foster daughter of Montaigne, proclaimed the equality of the sexes, and Marguerite de Valois, the wife of Henry IV, attempted to prove the superiority of the feminine intellect. Jacquette Guillaume published in 1665 *Les dames illustres* (*Illustrious Ladies, wherein is proven by good and strong arguments, that the feminine sex surpasses the masculine in every way*). In Germany the humanistic influence was strong. Cornelius Agrippa entered the lists in favor of the higher education of women, and in the seventeenth century a few German women reached a high stage of intellectual development. But these as well as the ladies of the great salons of the seventeenth and eighteenth centuries were rather sporadic phenomena than indications of any general improvement in the position of women.

In England the modern discussion begins with the appearance of Mary Astell (1668–1731), who demanded better education for women and criticized the unnatural relations of the sexes. In 1694 she published anonymously *A Serious Proposal to the Ladies, by a Lover of their Sex;* in 1696, *An Essay in Defence of the Female Sex,* and in 1700 *Some Reflections upon Marriage.* Her works met with general contempt and ridicule, though she found a strong supporter in Daniel Defoe, who remarks that "all the world are mistaken in their practice about women. For I cannot think that God Almighty ever made them so delicate, so glorious creatures, and furnished them with such charms, so agreeable and delightful to mankind; with souls capable of the same accomplishments with men: and all, to be only Stewards of our Houses, Cooks and Slaves."

In the France of the eighteenth century, where the idea of the rights of man was germinating, the rights of woman received scant consideration. Even the writers of the many utopias who attempted to picture the ideal state think of her only as wife and mother, and by some her moral and social inferiority is distinctly preached. Few appreciate her social significance, and fewer still her social and political rights. Man belongs to the state and woman to man is the theme of all the utopists. By a strange paradox Rousseau himself, upon whose philosophy more perhaps than that of any other writer modern feminism rests its claims, thought that the sole function of woman was to please man, and that her power to please was in direct proportion to her stupidity. But his doctrines could not escape in time their logical implication, though he himself did not choose to make it. His conception of a society founded on natural principles and ideas of social utility rather than on mere tradition and authority, and of the individual as the centre and supreme end of that society, is at the root of modern feminism. By the end of the eighteenth century the ferment of the philosophy of Rousseau among women became visible. On Oct. 28, 1789, a few months after the outbreak of the Revolution, the Parisian women presented a petition to the National Assembly for equal political rights, and in the same year Olympe de Gouges (q.v.) presented to the Queen Marie Antoinette her *Déclaration des droits de la femme* (*Declaration of the Rights of Woman*). The philosopher Condorcet included a proposal for full equality of the sexes in his plan for a new constitution in 1793. From 1789 to 1793 Revolutionary clubs of women flourished in Paris (Société des femmes républicaines et révolutionnaires, Amies de la Constitution, etc.). Petitions for the full political, economic, and legal equality of woman were made. The first feminist paper, *Le Journal de l'Etat et du Citoyen*, was published. The women attended meetings of legislative assemblies and took part in the Revolutionary movements, often with arms in their hands. Their enthusiasm was so great, in fact, that it became embarrassing to the Committee of Public Safety, who ordered the suppression of the women's clubs, 9th Brumaire, 1793, in spite of their protests. A period of reaction succeeded, which culminated under the Napoleonic régime in the harsh attitude of the Code Napoléon, the spirit of which is well expressed in the remark of Napoleon himself, "There is something which is not French, that is, when a woman may do as she pleases." The Code embodied in law the antifeministic spirit of the period and gave the husband a position of absolute superiority in the marriage relation—a position which holds good to-day in every part of Europe in which the influence of the Code Napoléon persists.

The idea of the rights of woman was carried to England by Mary Wollstonecraft, an Englishwoman whose own life, full of hardships and responsibilities, had given her an insight into the woman question far in advance of her contemporaries. Her *Vindication of the Rights of Woman* applied the French social philosophy to woman as well as to man. Natural rights, she says, are the property not of one sex, but of all humanity. The system of gallantry is really insulting and offensive. If woman is inferior to man morally and intellectually, that is due not to her inner nature, but to her social position and poor education. She demands the participation of women in legislation and the opening to women of all professions as well as of various trades and businesses in order that they may be protected from prostitution, which she analyzes clearly in its relation to the economic and social dependence of woman. She demands an equal moral standard for both sexes as the only sound basis of social ethics. Mary Wollstonecraft's work aroused contempt and indignation in women as well as men. Horace Walpole called her a "hyena in petticoats," and her influence over her contemporaries was slight.

The philosophical radicals of the school of Bentham, who dominated English social philosophy during the earlier part of the nineteenth century with their idea of utility as the final test of social institutions, were indifferent to the idea of the rights of woman, as indeed they were to all abstract theories of natural rights. James Mill expressed himself in 1824 adversely and was answered by William Thompson in his *Appeal of One Half of the Human Race, Women, against the Pretensions of the Other Half, Men to Retain them in Political, and thence in Civil and Domestic Slavery* (London, 1825). John Stuart Mill, however, was destined to become the prophet of the modern Englishwomen's movement, which he sought to justify on the ground not of abstract right, but of social utility, in his *Subjection of Woman* (1867), a most eloquent arraignment of the social and political oppression of woman. He demanded her complete legal and political emancipation from the condition of slavery in which she had been kept. This work, which aroused much enthusiasm and much acrimonious discussion, drew the English-women's movement into line with the predominant middle-class liberalism with its emphasis on political liberty and the efficacy of the suffrage as a means of emancipation. Through Mill's influence a movement sprang up which resulted in the modern English woman's suffrage movement, the most powerful of its kind in the world.

Of greater importance for the emancipation of woman, however, than any enunciation of theories was the change in the economic basis of society which began at the end of the eighteenth and continued through the nineteenth century, through which the old system of manual and agricultural production was replaced by machine industry. The vast changes wrought in the social structure by this industrial revolution were the factors which made not only possible but necessary the economic independence of woman. By the system of factory production a new division of labor was created which demanded and indeed enforced a readjustment of women in all social classes to their new economic position. The home lost its old importance as an economic institution now that all the necessaries of life were produced outside of it, and the woman of the home in the middle classes became conscious of the necessity of finding new fields of work outside in order to satisfy her ideals of usefulness or even to make a living for herself. Thus was laid the foundation for the so-called middle-class or bourgeois women's movement. For the women of the working classes, however, the new conditions assumed a more serious aspect. They and their children were employed in vast numbers in the factories instead of men because of the comparative cheapness of their labor, and were subjected to long hours, starvation wages, disease, and misery. The old domestic relations disintegrated completely, and woman exchanged subjection in the family for subjection in the industrial system. The result was demoralization for the man, deterioration, physical and moral, for the woman, and degeneration for the children. The evils of woman and child labor have occupied the attention of economists and reformers with ever-increasing force for the last century, and have been one of the most serious problems which the woman movement has had to face. The women of the middle classes early realized their responsibilities towards their working sisters, and the improvement of the condition of the working woman has always occupied an important place in their programme, through such measures as improved technical and general education for working women, employment bureaus, cheap hostelries, legislation for improvement of working conditions and the restriction of hours of labor, provision of crèches for children, and insurance of motherhood.

With the development of the capitalistic economic system, Socialism made its appearance and the result of the application of Socialistic philosophy to the woman question produced a new feminism, the extreme radicalism of which has often, though erroneously, been ascribed to feminism in general. The utopian Socialists of France, whose theories were much in vogue before 1848, included in their ideal of a future state the complete equality of men and women. Fourier bitterly attacked the ideals of bourgeois marriage and proposed freer sexual relations with the monogamic union as the ultimate ideal. The followers of Saint-Simon also cherished the free union as their ideal and proposed equality of men and women in all departments of public life in their future state. These theories were carried so far by Enfantin that they led to a division among the leaders of the Saint-Simonian school and the final break-up of the movement. Their ideas had had a great effect upon the thought of the time, however, especially through their embodiment in a genius like George Sand, whose literary reputation gave currency to her feminist ideas. A fearless prophet of Saint-Simonism in the struggle for truth and justice, she held up the ideal of the free personality for woman and the right to dispose of her love as she felt inclined.

With the supersession of utopian by modern Socialism a new type of Socialistic feminism appeared, based upon an analysis of actual economic conditions and their effect upon woman's position. Already in the Communist Manifesto (1847) Marx and Engels had alluded to the woman wageworker, driven out of the home, underbidding men in the labor market, and suffering more than they from capitalistic exploitation. For the woman worker as well as the man they could see no liberation but in the abolition of the capitalistic state. August Bebel gave this idea its greatest development in his work on *Woman and Socialism*, which has become the gospel of Socialist feminists. He analyzed the position of woman on the basis of the economic interpretation of history and concluded that bourgeois marriage had developed from bourgeois property relations; that it did not even satisfy the sexual instinct, as was indicated by the growth of prostitution; that it was not suited to modern economic relations and should therefore be changed to suit moral and natural requirements. A new order must be established in which the means of production should be the property of society, all possible technical and scientific improvements should be made in industry, the working hours reduced to a minimum, and the physical and spiritual development of society raised to the highest level. Only thus, says Bebel, can woman become a useful and independent member of society, develop all her physical and intellectual potentialities, and fulfill her sexual rights and duties. Marriage should be a private contract, and the rearing of children should become a social responsibility. The German Socialist party followed the same line of policy, vaguely at the Congress of Eisenach in 1869, more definitely at Gotha in 1875, and finally at the Congress of Erfurt in 1891 made a clear enunciation of the theory of equal rights: "The Social Democratic party of Germany struggles, then, not for new class privileges, but for the abolition of class mastery and of the classes themselves, and for equal rights and equal duties for all without distinction of sex and race. From this point of view it combats in present society not only the exploitation and oppression of the wage-worker, but every kind of exploitation and oppression, be it directed against a class, a party, a sex, or a race." This declaration sums up the attitude of Socialists in general on the woman question. They have stood everywhere for woman suffrage and the abolition of all legal disabilities of women. They have often refused, however, as in Germany, to coöperate with the middle-class women's movement on the ground that they represented the interests of the working woman which were opposed to those of the middle-class woman and that the movement of the working women was a class struggle and not a question of sex. Their main efforts are concentrated on organizing the working women economically in trade-unions and politically in the Socialist party.

The current of thought during the nineteenth century gave considerable support to feminism. The Romantic movement in art and literature during the first half of the century introduced a new personal type of love and a higher spiritual ideal of the sexual relation, which reacted upon the old patriarchal institution of marriage and tended to elevate it to a loftier plane of spiritual comradeship. This Romantic tendency in feminism culminates at the end of the century with the work of Ellen Key, the Swedish writer, who would bring beauty and harmony into life with a renaissance of love. She deprecates any type of feminism in which woman, in her search for equal opportunities and her eagerness to use them, forgets the all-essential elements of her happiness, love and maternity. Only the highest type of monogamic relation with perfect equality and comradeship can secure happiness in love. But even if excluded from love, maternity can still make woman happy. Upon this argument she bases the right to motherhood for every woman. For maternity is essential to woman's spiritual and physical development. But the child is the aim of all life. It should be the child of love and of health. Only the healthy and strong have a right to reproduce the species.

The most important scientific contribution to feminism during the last century has been the growth of knowledge with regard to the position of woman in the past and its causes. Beginning with purely historical works, such as those of Ségur (1803), Laboulaye, *Recherches sur la condition civile et politique des femmes depuis les Romains jusqu'à nos jours* (1843), and Legouvé, *Histoire morale de la femme* (1848), the research on this question extended into the field of anthropology, and a number of important works on the position of woman and the nature of marriage in primitive society, beginning with those of Bachofen, Lewis Morgan, and others, have introduced the evolutionary point of view into discussions of the woman question. The institution of marriage and of the family and the position and "sphere" of woman appeared in the light of science to have evolved gradually to their present state and to have differed greatly according to the special society in which they were found. This dynamic standpoint has revolutionized discussion upon feminism.

In the field, too, of a realistic understanding of sex great advance has been made. Researches into sexual psychology and pathology have thrown valuable light upon many sides of the woman question and supported the demand that social institutions be better adapted to procure the happiness and welfare of the individual. The work of Forel, Krafft-Ebing, and others on the Continent, and that of Havelock Ellis in England, are examples of this movement.

A new attitude towards woman has entered into literature, especially since the advent of Ibsen, whose great dramas presented to society a tragic picture of woman as an individual struggling in the toils of a hypocritical social system and emphasized the claims of the personality in woman even against those of society and the family. This tendency has since permeated literature to an increasing extent. The work of Björnson and Strindberg in exposing "social lies" and that of Ellen Key in developing a constructive philosophy of feminism have had an enormous effect, not only in Scandinavian countries, but in the world outside. In present-day English literature a marked feminist tendency is manifest in the work not only of Bernard Shaw and H. G. Wells, but also in that of Arnold Bennett and other milder spirits. Feminism has always counted some of the most illustrious French writers among its defenders, such as Dumas, Victor Hugo, Michelet, Marcel Prévost, and the brothers Marguéritte. The most conspicuous recent contribution is that of Brieux, whose exposé of the marriage system and the foundations on which it rests has created a profound impression in all countries.

The recent movement in philosophy, with its extreme individualism, on the one hand, and, on the other, its emphasis upon social solidarity, has given a great impetus to the women's movement, the results of which are visible in the recent literature of the subject, typical examples of which are Olive Schreiner's *Woman and Labor*, in which not only the right to work is demanded for women, but their duty to work is emphasized with an eloquent attack upon the "parasitism" of the modern woman of the middle classes, and the works of Charlotte Perkins Gilman, who bases upon biological and sociological premises her protest against a one-sided civilization or "androcentric culture," which can only be improved by the full participation of woman in the "human" work of the world and the restriction of her purely sexual functions within moderate limits, the reorganization of domestic work and child rearing on an efficient basis.

But feminism as a whole is by no means a conscious philosophical movement. The entrance of women into industry and the professions is often merely the result of economic pressure, but independence brings with it the desire of greater independence, and gradually the psychological foundations for a conscious movement are laid. Furthermore, even where this stage has been reached every possible gradation of radicalism is to be found—from the Christian feminism of European countries, which would improve somewhat woman's legal position without changing her relation to society and the family, to the feminism of the Socialists and extreme individualists, which would emancipate her completely in both these relations. The feminist movement as a social process includes all these manifestations, conscious and unconscious, conservative and radical. It is thus impossible to assign to it any definite uniform programme. Equality before the law and the right of suffrage are the most general demands at present, but many women's organizations in European countries do not indorse this. From the beginning the movement has stood strongly for education, or the right to knowledge, in the higher fields of science and philosophy, in the lower grades of primary and secondary education, and in the field of industrial and technical education, so that woman may be prepared professionally and industrially to take her place beside man in the work of the world—a step for which another struggle has to be made, which takes the form of demands for admission to all posts in the government service and for equal pay for equal work, for the right to practice medicine and law, the conquest of new fields of activity, the right of married women to work, the raising of the general level of women's wages and salaries, and the protection of the working woman from exploitation. Next comes the campaign against prostitution and the white-slave traffic. For the economic independence of woman not only freedom to work is necessary; she must be legally protected in the possession of her property and earnings. This involves the acceptance in law of the principle of "separation of goods." More radical proposals involve salaries for wives, widows' pensions, the state endowment of motherhood and the state responsibility for the rearing of children, and the emancipation from domestic work of the highly trained woman.

Lastly, feminist thought has developed æsthetic and moral ideals of its own. Dress reform, the introduction of hygienic æsthetic dress freed from the tyranny of style and the confinement of corsets, and the increase in athletic activity and open-air life will produce a new physical type of woman in whom freedom and beauty will be combined, say the feminists. At the same time this new woman will have quite new ethical principles, a stronger feeling of social responsibility, and a higher ideal of love and of maternal duty.

The nature and tendencies of feminism can perhaps best be explained by showing their actual course of development in certain typical countries. Feminism, though an international movement rising everywhere from the same causes, intellectual, economic, and moral, exhibits local differences in the individual countries. In Great Britain its aims have been predominantly political since the formation in 1866 of the National Society for Woman Suffrage under the influence of John Stuart Mill. The great interest which Englishwomen have taken in politics found expression in 1884 in the formation of the Primrose League, a powerful organization of Conservative women formed to aid the Conservative party in its support of church, throne, and empire. This was followed by the Women's National Liberal Federation, and by the Women's Liberal Unionist Association in 1888. Through these organizations Englishwomen have exercised a great indirect influence upon politics. The improvement of the legal position of women early occupied the attention of the women's movement. Until 1870 the married woman, when not protected by a marriage contract, had no rights with regard to property and could not even make a legal will. In 1870 women were given complete control over their earnings (in Scotland, 1877). In 1882 the Married Women's Property Act for Great Britain and Ireland extended this control over a woman's whole property and earnings and gave her a legal personality distinct from that of her husband.

Since the time of Mary Wollstonecraft the Englishwomen's movement had given up its attitude of sex antagonism and the struggle for "natural rights" and had come to realize that the position of women was due to economic and social causes for which no individual or sex could be held responsible, but that new economic conditions required a readjustment of the relations of the sexes and a coöperation of both in the world's work. During this period the movement was for the most part a middle-class one. The attempt was made to assist the middle-class woman, whose work was being taken out of the home into the factory, to take her place in the new division of labor. Education was necessarily the first point of attack. The foundation of Queen's College (1848) and Bedford College (1879), the admission of graduates of the latter to degrees in London University in 1879, the foundation of Girton College (1869) and Newnham (1871) at Cambridge and of Somerville College and Lady Margaret Hall at Oxford in 1884 and of Royal Holloway College in 1888 made provision for real academic training for women. In Cambridge and Oxford they are still refused degrees, though they are allowed to take the examinations. The University of Wales and several of the newer municipal universities, however, now admit women on a purely coeducational basis. The entrance to the professions, especially those of law and medicine, was more difficult. Women are not yet admitted to the bar, and were allowed to practice medicine in 1876 only after bitter struggles. There were, in 1912, 553 women physicians in Great Britain. The feminists of the period after 1850 were interested in promoting, not only higher education for women, but also secondary and lower education, and also in providing technical and industrial training which would enable women to enter new fields of industry. In this latter object they were very successful through the formation of educational and industrial unions. In general education also they effected great improvements. In 1867 the Schools Inquiry Commission inquired also into female education at their instance, and in 1869 the Endowed Schools Act recommended the use of a part of educational endowments for girls' education. Also through private gifts new schools were built, and a transformation worked in the education of girls.

The struggle against the legal regulation of prostitution began in England under the inspiration of Mrs. Josephine Butler. In 1864 the system of regulation had been introduced into England by the Contagious Diseases Act, which established inspection at certain garrisons and seacoast towns. In 1869 Mrs. Butler and others made a protest on moral, political, and hygienic grounds, organized the National Union of English Women, held meetings, and addressed petitions to Parliament. In 1870 they acquired their own paper, the *Shield*. In 1874 the campaign was extended to the Continent, became international in scope, and has continued in other countries, though it attained its ends in Great Britain in 1886. There have also been attempts at mitigating the social evil—rescue leagues, vigilance societies, and recently severe legislation against procurers in the Criminal Law Amendment Act. Trade-union organization is progressing among working women under the stimulation of Miss Mary McArthur, who reports 300,000 organized working girls in 1912 out of 5,500,000 women engaged in industrial occupations. In some cases also the women belong to the men's unions. Schools for mothers have been organized, and a Women's League of Service to prevent infant mortality. Motherhood insurance, a beginning of which was made in the Insurance Act of 1911, is now being demanded on a wider scale, and for the more radical nothing short of a generous endowment of motherhood by the state will suffice.

The whole energies of the movement seem concentrated now upon the attainment of the suffrage, but only as a means for carrying out a wider programme of feminism. In France feminism was identified with Socialism in the revolution of 1848. Two attempts were made, in 1848 and 1851, by the Socialists Considérant and Leroux to obtain the suffrage for women. Feminist societies were organized and feminist journals were founded: the *Politique des Femmes*, *L'Opinion*, *Voix des Femmes*, and feminists and Socialists went into exile together at the fall of the Second Republic. The feminism of the Second Empire was of a more bourgeois character. Maria Desraismes and her friend Léon Richer were the leading spirits. They founded in 1876 the Society for the Improvement of Woman's Condition (Société pour l'amélioration du sort de la femme) and conducted an energetic campaign for the civil and political equality of the sexes, of which the controversy with the antifeminist anarchist Proudhon and the conversion of Dumas fils were interesting features. Victor Hugo, Emile de Girardin, and other illustrious men became adherents of the cause. Petitions presented to the Chamber of Deputies were without results. In 1880 was founded La ligue pour le droit des femmes, in 1890 L'Union universelle des femmes, in 1891 La Solidarité, and in 1896 Le féminisme chrétien. A committee founded in 1896 to urge special legal reforms was successful in 1907 in procuring the legal control of a woman over her own earnings. Another group, L'Egalité, founded by Madame Vincent, devotes its attention exclusively to historical research on the position of women. Philanthropic organizations of women have a society of their own. In 1897 was founded a daily feminist paper, *La Fronde*, which is edited, published, and printed exclusively by women.

The morality movement, which follows the inspiration of Mrs. Josephine Butler, includes a society, Adelphia, which, with the institution Œuvre libératrice (founded 1901), attempts to aid unfortunates and assist them back to a normal life. Trade-union organization has progressed and has been assisted by middle-class women, between whom and the Socialist women there is no such sharp line drawn as in Germany. The movement for women's education has been assisted by the government since 1880, since it fell in with the anticlerical policy of the Republicans, who sought to get the education of girls out of the hands of the Catholic church. State lycées and normal schools for women were organized, and in elementary education both sexes were treated alike. French universities have admitted women since 1867. They have obtained the privilege of practicing medicine and law. Madame Curie became in 1907 the first woman professor at the Sorbonne. The National Council of Frenchwomen has promoted trade-union organization among women, investigated the marriage laws, and organized a woman's suffrage department. Since 1907 the paper *La Française* has appeared. In 1909 the French Woman's Suffrage Society was organized.

The legal position of Frenchwomen is still very low under the influence of the Code Napoléon. The woman is strictly subordinate in the marriage relation, the authority of the father is unlimited, and the investigation of paternity in the case of illegitimate children is still practically forbidden.

In Germany the "emancipation of the heart" which came to a few women with the Romantic movement in literature was followed by the democratic enthusiasm of the liberalism of 1848, but the general decline of liberalism since that time carried with it the enthusiasm for political rights, and the suffrage movement has never been so strong in Germany as some other sections of the feminist movement. This is due also to the difficulty in leading women of different political convictions to coöperate and to the wide gulf between Socialist and middle-class feminists. The latter have, since 1865, followed the English example in encouraging women's work and education. In that year they founded the Berliner Lette Verein for the improvement of the industrial efficiency of the girls of the upper classes, and also the Universal German Women's Union for the improvement of women's education as a whole and the bettering of the conditions of the working women. Since 1888 a more radical movement has developed which demands complete equality of the sexes everywhere and places its political and social programme more in the foreground. The Union of Progressive Women's Unions was formed with this policy, to encourage instruction in hygiene, the protection of the working woman, the improvement of the legal position of women, the training of women for philanthropic work, and the admission of women to the higher state examinations, and to avoid the separation of middle-class and working women. It had, in 1910, 23 branches with 2000 members and published its own paper, *Die Frauenbewegung*. In 1889 the Union of Woman Employees was founded and now numbers about 150,000 members. It conducts a labor bureau, sick and accident insurance, loan bureau, evening and commercial schools, and supplies its members with free legal aid. It includes many subordinate unions and exercises a powerful effect upon legislation. A campaign for morality has been conducted since 1889, when the society Jugendschutz was founded. It has conducted a hygienic and ethical propaganda and has established a home for working girls.

The Socialist women are organized on a basis of equality with men in the Socialist party and refuse all coöperation with the bourgeois women. They have recently conducted special congresses of their own in conjunction with the party congresses and conduct a paper, *Die Gleichheit*, under the editorship of Clara Zetkin. They have been very successful recently in organizing working women into Socialistic trade-unions.

The conquest of higher education has been recent. In 1891 women were admitted to lectures at Heidelberg and in 1901 allowed to matriculate. Prussia and most other states followed, though with hesitation. In 1908 Prussia abolished all limitations, and now no German university is closed to women. In the summer semester, 1911, women to the number of 2252 constituted 4.4 per cent of the entire student body in German universities.

In the United States, which has been called "the promised land of feminism," the woman movement is based upon the French Revolutionary tradition of natural rights, which appears in American form in the Declaration of Independence; in practical activity it dates from the period of the antislavery agitation, in which women were especially active. Their demand for human rights and freedom for the negro drew their attention to their own condition. In 1840 the American women delegates to the Antislavery Congress in London were refused admittance upon the ground of their sex; therewith one of them, Elizabeth Cady Stanton, conceived the idea of a movement against woman slavery, an idea which she carried into effect in 1848 with a conference to which she presented a list of the grievances of women drawn up in the form of the Declaration of Independence. In 1850 a second conference was held, the National Woman Suffrage Convention, and the complete enfranchisement of women demanded. After the war the propaganda revived, and in 1869 two suffrage associations were formed which united in 1890 to form the National American Woman Suffrage Association.

The agitation for political equality is the most conspicuous side of the feminist movement in the United States at present, but the other lines of development should not be ignored. In the field of education extraordinary progress has been made. With the opening of Oberlin College to women in 1833 on equal terms with men began a great movement towards coeducation which has affected all of the public high schools and State universities and many of the private institutions as well. In addition women have several finely equipped colleges of their own.

The suffrage movement has made great progress in recent years. Four States were added in 1912 to five which already permitted women to vote and strong campaigns are being conducted for the franchise in other States. A constant agitation is also carried on at Washington for a Federal amendment in favor of woman suffrage. (See Woman Suffrage.)

Perhaps the most important aspect of feminism in America is the extent to which women are entering every profession and every field of labor naturally and efficiently. Women police, justices of the peace, and even mayors are no longer a novelty, and women are holding important public offices with increasing frequency. The number of women workers in all occupations has risen from 2,647,570 in 1880 to 4,005,532 in 1890, 5,319,397 in 1900, and, in 1910, 8,075,772, as compared with 14,744,942 men in 1880 and 30,091,564 in 1910. In 1910 in domestic and personal service 2,620,857 women were employed and 2,740,176 men. In professional service there were 673,418 women and 1,151,708 men. The number of women physicians had risen from 2432 in 1880 to 13,687 in 1910, of women lawyers from 75 to 1343 for the same period, of government officials from 2172 to 14,544, of journalists from 288 to 4181, of women in literary and scientific pursuits from 2764 in 1890 to 13,521. If this process continues at its present rate, it means a revolutionary change in the position of women. There are no indications of its abatement. Rather the demand becomes more insistent every year that no discrimination be made in the civil service or in other public positions against the employment of women on the ground of their sex.

For the working woman a programme of protective legislation is being put into operation, including restriction of hours, improvement of working conditions, widows' pensions, regularization of work, and a minimum wage; and trade-union organization has progressed rapidly with the assistance of the National Women's Trade Union League and its local branches.

A fresh feminist agitation, hardly yet organized but apparent in the press and in literature, is making irreconcilable demands for absolute emancipation of women in every field on the lines of the more radical European movement, and for the present has monopolized the title "feminism" in the public mind. With the success of the suffrage agitation, which present conditions seem to indicate, strong support will be given to all the other phases of the women's movement, political, economic, and social.

Feminism is progressing more slowly in countries of inferior culture or undeveloped economic conditions, but there are extraordinary indications of its presence in all countries, including Turkey, India, Japan, and China. An extraordinary feminist movement has developed also in the Scandinavian countries.

The feminist movement is organized further on an international basis, and in this American women took the lead. The National Council of Women, formed in 1888 at the instigation of Mrs. May Wright Sewall, soon extended to other countries and became an international organization which now includes 23 national unions. It aims to establish regular intercourse between the women's organizations of all lands and holds congresses every five years, the last of which took place in Rome in 1914. In 1904 the International Women's Suffrage Alliance was formed. By 1910 it included 26 national branches and since 1907 has published its own organ, *Jus Suffragii*, and has held several international congresses.

For the progress of the movement in other countries, consult the works of Dr. Schirmacher and Mrs. Snowden. See Woman Suffrage, *Women in Industry*.

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FEMMES SAVANTES, fȧm sȧ'văNt', Les (Fr., The Learned Women). A comedy by Molière (1672), adapted from *Les précieuses ridicules*. It is a satire on feminine pedantry.

FE'MUR (Lat., thigh). The thigh bone. In general terms, it consists of a shaft, very slightly curved, and two extremities. The upper extremity bears two projections, called the greater and lesser *trochanters*, for the attachment of muscles, and a short *neck*, nearly at right angles to the shaft, terminated by a hemispherical *head*, which, being received into a cavity of the pelvis called the acetabulum, forms the hip joint—a ball-and-socket joint. The lower extremity of the femur has on each side an enlargement called a *condyle*, or knuckle. The articular surface of the condyles is hemicylindrical, as also is the somewhat depressed space between them, called the *trochlea*, and with the large bone of the leg, called the *tibia*, forms the knee joint—a hinge joint. The femur is attached to the pelvis by two ligaments—a capsular ligament, which incloses the head and neck, and the *ligamentum teres*, a short ligament which joins the head with the bottom of the acetabulum. It is attached to the tibia by several ligaments, placed in different positions, to combine strength with freedom of motion; the most important of these bands are the lateral ligaments and the crucial ligaments. The crucial ligaments cross from one member of the joint to the other in oblique directions. Powerful extensor and flexor muscles, besides performing their ordinary functions, aid in keeping the parts in apposition. The femur has a wide range of distribution in the animal kingdom and is not the exclusive property of warm-blooded animals. In man it is the strongest, longest, and largest bone. In the whale it is only rudimentary. In fishes it is not represented, but is developed in varying degrees in mammals, birds, reptiles, and amphibians. It is a short bone in the ruminants and the horse family. In the tortoises the curve is considerable, while it is almost straight in carnivora, bats, etc. In many reptiles it is rudimentary. For illustrations, see SKELETON.

FEMUR, COMPARATIVE ANATOMY OF. Although certain comparative anatomists have attempted to find in the metopterygium of the fin of a fish a homologue of the femur, it is beyond question that such a bone is not actually found below the more or less terrestrial amphibians. In the short-legged members of that class (Urodela) the femur is a short and relatively unimportant bone; but in those forms whose chief mode of progression is by leaping (Anura) it becomes the longest and most important bone of the hind limb. Among reptiles we find the femur, when present, a short but very stout bone, reaching its strongest development among the Crocodilia, though the lizards and turtles are not far behind. Among snakes a femur is present only in the families Tortricidæ and Pythonidæ, and in those cases it is greatly aborted. The femur is sometimes lacking in lizards, and in other cases is rudimentary. Among birds the femur is a short, stout bone embedded in muscles and concealed beneath the skin; its upper, articular end is rounded and almost at a right angle with the main shaft; the terminal condyles are large, and on the outer is a ridge which plays between the heads of tibia and fibula. Most mammals possess a well-developed femur, the relative length of which depends very largely upon the habits of the animal and the proportions existing between the fore and hind limbs. No femur is present in the manatee or the dugong, and it is wanting also in most of the Cetacea. In some whales, however, which possess a rudimentary pelvic girdle, a small bone lying just outside the latter is thought to represent the femur. Monkeys possess femurs most nearly like that of man, and this is especially true of the anthropoid apes; yet even the gorilla, which in this respect is the most manlike of all the apes, has certain peculiarities of the femur by which the expert can distinguish it from man. These differences between the femurs of apes and man are so readily recognized that when the famous remains of *Pithecanthropus erectus* were found in Java by Dubois, their position, intermediate between man, whom they approach in cranial character, and apes, was determined by the examination of the femur, this bone showing certain pithecoid characters quite strongly.

FENCE (by aphæresis for *defence*, *defense*, from Lat. *defendere*, to ward off, from *de*, down + *fendere*, to strike; connected with Gk. *θείνειν*, *theinein*, to strike). In agriculture, a barrier, more commonly constructed of stones, rails, planks, pickets, or wire, used to inclose some space or to separate it from an adjoining area. Fences are primarily intended to confine farm animals to a definite area, or to prevent those of one farmer trespassing on the premises of his neighbors.

Legal Aspect. Fence laws are quite generally in force in the United States, but their requirements are very variable. In some cases they require each person to fence in his own stock, but not to fence out the stock of others. In other cases the reverse is true, especially in sparsely settled regions, where the amount of unoccupied land is so much larger than the occupied area, and the grazing system prevails. Great legal diversity also obtains in different States regarding division fences, highway and railway fences, and what in a legal sense constitutes a fence.

Necessity. Fencing is more general in the United States than in European countries. It has been stated that the farm fences of the United States cost more than the farm buildings. Much fencing is undoubtedly done that is useless, expensive, and unsightly. Many fences, like the zigzag fence and the stone fence, take up much valuable land that might otherwise be profitably cultivated, and besides they harbor weeds, insects, etc. The extent to which fencing is necessary depends mainly upon the laws in force. Where every owner of stock is liable for the damage done by them, the fencing may be limited to that required to keep the stock confined on his own premises. Still, even in this case many prefer completely to fence their premises rather than be annoyed by the unpleasant consequences of depredations of a careless neighbor's stock. However, it may be laid down as a general rule that from both æsthetic and economical considerations only such fences should be maintained on a farm as are absolutely necessary.

Rail Fences. When timber is abundant, as it is in the early days of the settlement of well-timbered regions, the zigzag, worm, or Virginia rail fence is commonly used. Such a fence properly built, of good timber, is durable and effective, but is wasteful of land and timber and is expensive when the supply of the latter becomes limited. It is then often replaced by other cheaper forms of pole, brush, or wicker fences, or by the neater and more substantial board fences.

Stone Fences. In regions where stones abound, fences have been built to serve the double purpose of a fence and of a place of deposit for surplus stones. They are substantial, but expensive, on account of the labor required in their construction, and often wasteful of land, because they too frequently become merely long piles of stones around the fields.

Sod Fences. Where both timber and stones are lacking, sod has been successfully employed in the construction of fences. At best, sod fences are makeshifts.

Hedges. In England and other European countries hedges are employed in place of fences to a much greater extent than in the United States. The objections to them are that they are slow of growth, expensive to keep in order, that they "draw" the adjacent land, harbor weeds, insects, etc., and throw a considerable amount of land out of cultivation. There are many cases, however, in which the hedge proves both useful and ornamental. The favorite hedge plant in England is the hawthorn. In the Middle and Southern United States the osage orange is probably most commonly used. The arbor vitæ and the boxwood (for evergreen hedges) and the privet are also frequently used. When used as fences, hedges are frequently planted on embankments of ditches or double ditches.

The Picket Fence. This form of fence is used especially for inclosing yards and gardens. It may be constructed of cheap split pickets, or of the very ornamental and expensive kind, the variety of styles being almost infinite. The picket fence forms an especially effective barrier for small animals. It may be constructed entirely of wood, of wire and wood, or of iron.

Wire Fences. Post and wire fences are probably more extensively used than are any other kind, especially in regions where timber is scarce. The single wire does not resist changes of temperature and is not as strong as the twisted wire. Firmly twisted steel wire, with barbs at short intervals, is the kind most widely used. The barb-wire fence takes up little space, is not destroyed by fire, is easily repaired, and is readily adapted to inequalities of surface. It may also be so constructed as to form an effective barrier to stock and trespassers of all kinds. The principal objection urged against it is its liability to injure stock. For this reason it is better suited to large areas than to small inclosures in which animals are likely to be more or less crowded. Various means have been proposed for overcoming this danger, but with only partial success. Two-strand twisted wire, with two-pointed and four-pointed barbs, are used, as well as flat and twisted, barbed and unbarbed, flat steel straps. The barbs should be just long enough to repel infringing animals without inflicting serious injury. Various implements have been devised which greatly facilitate the construction of wire fences. It is generally considered that two strands of barb wire, 22 inches apart, the lower 22 inches from the ground, will turn horses, cattle, and young stock, and one strand is sometimes used as a temporary barrier for the larger stock. A fence of three strands, 12, 23, and 42 inches from the ground, is more effective than a two-strand fence. Four-strand fences, with the strands 5, 12, 22, and 48 inches from the ground, are commonly used, with or without a baseboard close to the ground. Five strands, it is claimed, will turn dogs, pigs, poultry, and other small animals. With embankments, fewer strands are required for an effective fence. It is common to use posts 8 feet apart, as in board fences, but fewer posts are frequently made to serve. The corner posts should be securely braced, in order that the wires may be tightly stretched.

Flood Fences. Across streams subject to floods, or sloughs too wide for floodgates (see below), fences are often a necessity. These are usually constructed in panels, on logs, which are linked together and fastened to posts on the banks with iron couplings, so that the fence rises and falls with the flood.

Hurdles, or Portable Fences. These are often useful. They may be constructed of wood or of wire, in a variety of ways, depending upon the purpose for which they are to be used.

Gates have generally replaced the more primitive bars, being more sightly and convenient. When properly made of well-seasoned lumber or of metal, they are very durable. The styles of construction are almost infinite. Gates for roadways should be at least 14 feet wide and should be well braced so that they will not sag. The styles of hinges and especially of fastenings are almost as numerous as the kinds of gates. (See also GATEWAY.) When fences cross streams or gulleys subject to flood, it is necessary to employ floodgates, which are panels of fence suspended on hinges so that they yield to the force of the flood and resume their position when it subsides.

Posts. The best timber for posts is probably supplied by red cedar, yellow locust, black walnut, white oak, and chestnut. Timber for posts should be cut when the sap is dormant, e.g., in midwinter or in August. The bark should be removed before setting the posts. Various means of preserving posts have been proposed. Soaking the part to be placed in the ground in kerosene and afterward coating with coal tar has been found effective. Soaking in blue vitriol (1 pound of vitriol to 40 of water) and in hot creosote and charring have also been recommended. The creosote treatment has been found most practical by the United States Forest Service. In recent years, as a result of scarcity or high cost of suitable timber for the purpose, concrete posts for wire fences have come into considerable use.

In general it may be said that fences should be built only when absolutely necessary, and then substantially constructed of good material, since a good fence will prove more economical in the end than a poor one.

FENCE, FENCING (IN LAW). At common law, a landowner is under no duty to maintain a fence, either to mark his boundary line or to protect his premises from trespass by man or beast. On the other hand, every one is under a common-law duty to keep his cattle from trespassing upon the land of others. Accordingly the introduction of fences, in agricultural regions at least, appears to have been for the purpose of keeping cattle in rather than of shutting them out. They were resorted to as a convenience rather than a protection.

While the common law does not confer upon a landowner the right to force his neighbor to maintain a fence, it does permit him to acquire such a right by grant or prescription. When the right is so obtained, it is called an easement, and the land, whose owner is thus bound to maintain a fence, is said to be subject to a servitude. A contract under seal by a property owner with his neighbor to build and maintain a fence upon the land of the former for the protection of the neighbor's premises, not only creates a personal liability enforceable against the promisor, but it may, if so intended, create an incumbrance upon his land in the nature of an easement. A prescriptive liability of this character is not common, nor is it easily established. One who claims it must be prepared to show not only that the person charged has uniformly repaired the fence in question, but

also that he has so repaired it at the request of the claimant and in recognition of the latter's right.

In some of our States the common-law rule that landowners are not bound to fence against trespassing cattle has been rejected by the courts, as unsuited to the conditions and usages of a new country; and the rule has been adopted that the owners of cultivated lands can recover for damages done thereto by trespassing cattle only when they are inclosed by good and sufficient fences. This rule has been recognized by the United States Supreme Court as applicable to the public lands of the Federal government. In all of the States, and in England, the common-law doctrine has been modified by statute. It is impossible here to describe this legislation in detail, but its characteristic features are these: 1. It imposes upon adjoining landowners the duty of contributing equally towards the erection and maintenance of division fences between the improved or cultivated portions of their lands. 2. These fences are to be so built that the line between the two estates shall pass through the middle. At common law the owner, who was bound to maintain a division fence, was obliged to construct it wholly upon his premises. 3. What constitutes a lawful fence is generally fixed by the terms of the statute, or is left for definition to local authorities. In England barbed wire fences along highways are prohibited; but in this country their use is permitted. 4. Division fences are intended, under modern legislation, as a protection against cattle rightfully on adjoining land, and only against those. In some cases, however, the statutory duty to fence is an absolute one. Such, as a rule, is the duty of railroad companies. Until they erect and unless they maintain the statutory fences, they are liable to all damages inflicted by their engines and cars upon cattle straying upon their tracks. They may even be liable to passengers and employees who are injured in collisions with trespassing cattle. The private-property owner, however, owes a duty of fencing only to his immediate neighbor. If his fence conforms to statutory requirements, he is not liable to his adjoining neighbor for the trespasses of his cattle upon the latter's land, unless they are unruly beasts. On the other hand, he cannot recover for the trespasses of his neighbor's cattle if his own fences are defective. A fence is a part of the land. This is true even of a rail fence, although no stakes are set into the ground. The same doctrine has been applied to fencing materials which are temporarily detached from the soil when there was no intention of diverting them from their original use. They are real estate, not chattels. See Hunt, *Law of Boundaries and Fences* (London, 1896); Thompson, *Law of the Farm* (San Francisco, 1896); id., *Law of Boundaries and Fences* (Albany, 1874); Thornton, *Railroad Fences and Private Crossings* (Indianapolis, 1892).

FENCE LIZARD. A small, active, and harmless iguanid lizard (*Sceloporus undulatus*), common throughout all the warmer parts of the United States and Mexico. It is exceedingly variable in color, but Eastern specimens are usually brown green above and whitish below, with an indistinct stripe on each side, above which is a double series of narrow undulating V's, pointing forward. The males have a black mark diverging from the chin to each shoulder, and other blue and black patches and marks on the under surface which are lacking in the females. Texas and Sonoran examples form the paler variety *consobrinus*, and a Rocky Mountain variety (*tristichus*) is distinguished by its green color and eight crossbands.

This little animal is exceedingly active, running swiftly, dodging about tree trunks with incredible agility, and hiding beneath loose bark, etc., for repose and safety. It climbs trees to some extent, but keeps mainly near the ground, darting along fences and prostrate logs in pursuit of insects or in fear of hawks and similar enemies. De Kay states that it has some power of changing its colors, and that when irritated it elevates its spinous scales and bristles into a formidable appearance; it is, however, entirely harmless and makes an amusing pet. It multiplies by eggs laid in dry earth, probably in little groups, in early summer. "The eggs are long and narrow, are covered with a tough coat . . . and are abandoned to their fate, but when the young are hatched they are treated with the utmost gentleness by all the adults." For systematic facts, consult Cope, *Crocodilians, Lizards, and Snakes* (Washington, 1900); for breeding habits, Hay, *Batrachians and Reptiles . . . of Indiana* (Indianapolis, 1893); Ditmars, *The Reptile Book* (New York, 1907); also popular accounts in the books of De Kay, Abbott, Sharp, and similar writers.

FEN'CIBLE. A term formerly applied to bodies of militia, yeomanry, or volunteers in Great Britain. They were enlisted entirely for local defense. The name is now practically obsolete except as a designation of a few historic corps. Formerly not an uncommon title assumed by organizations of State militia in the United States; as, "The State Fencibles."

FEN'CING. Specifically, the art of attack and defense with sword or rapier, but frequently employed so as to include the use of such weapons as foils, singlesticks, broadsword, quarterstaff, bayonet, lance, etc. There is not much evidence to justify the assumption that fencing as an art was practiced before the advent of the rapier in the sixteenth century, although it has been conceded that some crude system

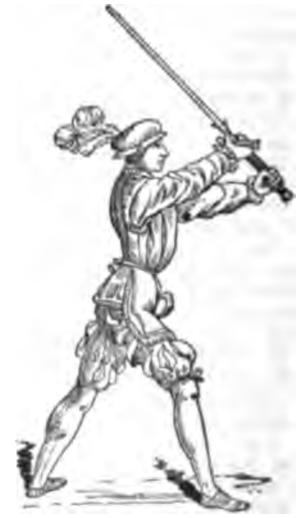


FIG. 1. FENCING POSITION WITH TWO-HANDED SWORD.

of fence must have been necessary for the proper play of the *hâche d'armes*, or poleaxe, a weapon about 5 feet in length and used with both hands. The knight depended, as a rule, on the strength and temper of his armor for defense and on the force and accuracy of his lance thrust for attack; but the employment of a shield to ward off attack, by sword or other weapon, suggests that some form of fence was known. The swords in use at this time were the heavy two-handed swords (Fig. 1), the bastard sword (a heavy weapon, which, however, might be used with one hand), and the ordinary single-handed sword. Each type was made with double edges and a point. From the middle of the sixteenth to the middle of the seventeenth century was the most prolific period in the variety of weapons introduced, and also the period from which fencing may properly be said to date. The most important weapon of the group was the long Spanish-Italian rapier, with its adjuncts, the poniard (Fig. 3) or the cloak (Fig. 4). It was practically a development of the cross-hilted sword, and arrived at its most perfect form early in the seventeenth century, when the "swept" hilt gave place to the "coup." Armor was no longer worn, so that combatants fought stripped to their shirts and, owing to the deadly nature of a rapier thrust, were compelled to cultivate the art of fence. Italian fencing masters were in demand, but, owing to the length and general unwieldiness of the weapon, their instruction was far from the complex method it afterward became. In avoiding an opponent's rapier recourse would be had rather to change of position with the body than to changing positions of the weapon itself, and parries with the dagger were equally few. The period of the rapier has been described as the most quarrelsome period in history. During the reign of Louis XIII of France the rage for dueling became more virulent than ever, and the use of the rapier, and consequent knowledge of its practice, grew to be widespread, with the inevitable result of considerably altering the style and size of the rapier. The hilt gradually took the shape of a cup, and the blade was so shortened and lightened that the possibilities of attack and defence were greatly increased, and a weapon for the left hand became unnecessary. The *parry*, and as a natural consequence the *feint*, which with the previous heavy and unwieldly weapon had been impossible, became now an absolute necessity and, combined with the *lunge*, marked a great advance in the art of fence. The "lunge," or forward movement of the leading foot, was first suggested, so far as is known, by a celebrated Italian fencing master of the sixteenth century, Di Grassi, whose work, published in 1574, and translated into English by "J. G., Gentleman," in 1594, was long regarded as an authority. At this time such footwork as was practiced consisted of passes, or steps forward, backward, or to either side; with the addition of *voltes* and *demivoltes* as needed, during which the swordsman was required to keep the knees as nearly straight as possible. The universal prevalence of dueling (q.v.) during the eighteenth century brought about further improvements in the weapons, and finally evolved the slender featherweight rapier now known as the *small sword*. The elementary circular, or counterparry, proved to be of sufficient value to compel sword makers to alter the shape of the blade, by fining down its excessively broad forte, and making it taper gradually from hilt to point; thus, the "walking sword" of the closing decades of the eighteenth century became as light and supple as is the fencing foil of the twentieth century. Among the many famous fencing men of this period may be mentioned the Chevalier de Saint-Georges, the half-breed son of a rich planter of Guadalupe; the French Chevalier d'Eon de Beaumont (1728–1810), so long believed to be a woman; and Angelo, the founder of a family for several generations conspicuous in the annals of fencing in Great Britain. Since the days of armor, up to the eighteenth century, protection for the face or other parts of the body in a fencing bout was unknown, and all the great fencing masters of the rapier recommended enormous buttons—in many instances, it is recorded, as large as

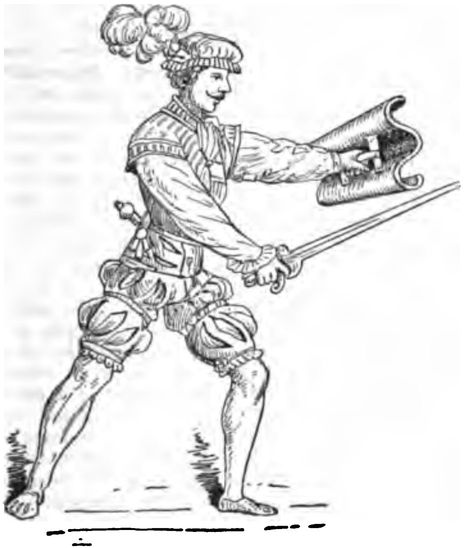


FIG. 2. TWO-EDGED SWORD AND BUCKLER.

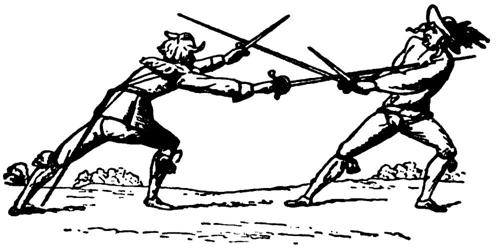


FIG. 3. COMBAT WITH RAPIER AND DAGGER.

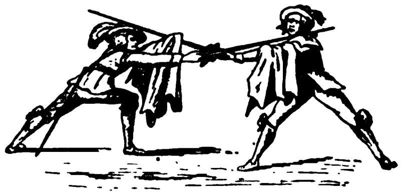


FIG. 4. COMBAT WITH RAPIER AND CLOAK.

a tennis ball—which, being affixed to the point of the weapon, afforded a measure of protection to an opponent. During the earlier part of the small-sword period it had also been the custom in the *salles d'armes* for a fencer to withhold his *riposte* after making a successful parry, in order that his opponent might have time to recover from his lunge and escape any possible injury to his face. The elder La Boessière is said to have been the original advocate of protection for the face, but his idea met with a very indifferent reception from the fencing fraternity, who vehemently denied the necessity of such protection on the part of themselves. When first introduced, the mask was of solid metal, in which openings were made for the eyes, and thus left exposed the very parts that most needed protection. An accident, by which a prominent instructor lost the sight of an eye, soon demonstrated the necessity of eye covering, which in time led to the present meshwork mask. At the beginning of the nineteenth century the use of the glove, plastron, sandals, and mask had become general, and while gentlemen no longer carried the walking sword, a form of it still holds sway in France, in the *épée de combat*, the favorite weapon of duelists throughout the world.

Fencing in France. It is supposed that Henri Saint-Didier, who taught fencing in Paris about 1570, was the first to give names to the different thrusts then in use, such as *maindrette, renverse, fendante, estocade*, and *imbrocade*. Pater, a later teacher, divided the various parries into five distinct classes, viz., prime, seconde, tierce, quarte, and quinte; and similarly with few exceptions every other term used in the art has had a French origin. Modern fencing in France owes most of its perfection to the military academy of Joinville-le-Pont, near Paris, established by the government in 1872, and known as the High School of Military Gymnastics. In this institution are trained the masters at arms, who on graduation are assigned to the various regiments and corps of the French army. The number of men graduated each year, however, is in excess of the number of appointments to be filled, so that many of them are compelled to enter into competition for their livelihood with the prévôts or lieutenants of the civilian masters throughout the country. In Italy fencing is not now so popular as it is in France, nor is the Italian method as practiced by its leading present-day exponents as distinct from the French as it was formerly (although the original Italian method is still enthusiastically taught at Naples), but is apparently being dispossessed by its French rival from all the countries in which it was formerly supreme.

Fencing in the duel is influenced in France largely by the rules governing the use of foils in the *salles d'armes*. There is usually an umpire to enforce the rules and see that the combatants maintain the regulation distances from each other, so that only the hand or arm is in danger. Occasionally a duel will have a fatal termination, either designedly or by accident; but in the vast majority of encounters, should either combatant make too desperate an attack or rush, the umpire interferes, and the first scratch ends the affair. In Germany the duel is more consistently prohibited than in France (see DUELING); but even there, duels with the rapier or dueling sword are of occasional occurrence and are almost invariably of a serious character. The student duels are fought with the *Schläger*, a pointed sword with a long double-edged blade, sharpened only towards the point, and the fencing in vogue partakes more of the violence and action of the Italian than the more reserved style of the French.

Some of the more important positions and principles of fencing are as follows: Movements for attack are called thrusts, and those for defense parries; a *feint* is a movement designed to mislead an opponent. When on *guard*, the body is so placed as to present a profile to the opponent; the right foot forward, the right arm half bent, with the elbow at the distance of about 10 inches from the body, the left foot 20 inches behind, and at right angles to the right foot, knees bent, body erect and well poised on the hips, inclining slightly to the left, so as to facilitate the right leg in the lunge. The *attack* is an endeavor to hit, either by a simple or a composite thrust—*simple* when resulting from a single movement, and *composite* when resulting from several. A *straight thrust* is a direct hit, obtained by straightening the arms and lunging, and a *disengagement* is a change of lateral lines followed by a straight thrust, which differs from the *coupe*, or *cut*, in that it is under instead of over the opposing weapon. To *riposte* is to attack after having parried—either immediately or after a single interval; and to *counterriposte* is to attack after having parried a *riposte*. The *coupe de temps*, or *time thrust*, is an attack anticipating or surprising an opponent in the preparation of his own; and the *coup d'arrêt*, or *stop thrust*, is a rapid attack developed during the advance of an opponent. *Feeling the blade* is an operation demanding long practice, as well as a delicate sense of touch; by it contact without pressure is made with the opposing weapon, which together with the knowledge gained by the eyes will indicate the beginning of an attack and enable the defense to deflect a thrust without unnecessary violence. An attack may be delivered either at the breast, or on the right (the right side of the body or face), on the left (corresponding to the right attack), and below, the region under the sword arm. There are at least 10 parries requisite to meet all the thrusts that can be directed at the body, designated by the old French ordinal numbers: prime, seconde, tierce, quarte, quinte, six, sept, octave, countertierce, and counterquarte. To confuse an opponent by making a feint, or to secure position after retreating, resort is had to the *appel*, which is executed by striking the right foot smartly on the ground. The art of disarming an opponent by twisting or forcing his weapon out of his hands is but little practiced, owing to modern fencing etiquette, which does not permit the striking of a defenseless man. The essence of good fencing is to exercise caution and prudence before attempting a thrust, and never to riposte until after the parry has been made. Retreats must be covered by parries, which should invariably be well and closely made. To husband the strength and keep cool, together with a constant watchfulness for a successful lunge, constitutes almost certain success against even a superior swordsman, should the latter be impetuous and indiscreet in his lunging. The use of the *small sword* is now principally confined to dueling, and proficiency in its play in nondueling countries is sought more as an accomplishment or recreation than as a means of self-preservation. The small sword is for pointing only, which is of all attacks the most effective, since in fencing the point is made with the full force of the arm reinforced when lunging by the weight of the entire body; a combination impossible in the "cut," which can only be delivered by the force of the arm alone.

The substitute for the short sword is the foil (see Fig. 5), and on no account should practice against an adversary be engaged in without the protection of a wire mask for the face. There should also be worn a leather breastplate or pad, to cover the entire right side and hang a little distance over the lower part of the body. It should also have stitched to it a leather collar buttoned at the back, for the protection of the neck.

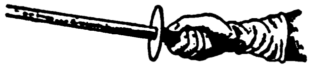


FIG. 5. HAND POSITION, WITH FOIL.

The *foil* is made of yielding steel, with a leather-covered or rubber button fixed to its point. The temper of the foil should always be ascertained before commencing practice, by placing the point on the ground and pressing downward until the blade assumes a considerable arc of a circle, after which it should be allowed to spring back by suddenly releasing the point. A well-tempered foil can at all times be straightened out by placing it under the foot, bent part uppermost, and then drawing it backward to the point.

Sword Fencing. The sword is a weapon made for the purpose of cutting by the delivery of a blow. It has two distinct parts available for attack and defense, in addition to its point: (*a*) The *centre of percussion*, or that part of the sword in which the greatest force of the blow is concentrated, comprising about one-third of the blade's length from the point; and (*b*) the *forte*, which measures about one-third the sword's length from the hilt, and in which the best strength for defense is maintained. Although the weight of the sword tells against its utility as a thrusting weapon, it is nevertheless fashioned for use with the point, and the thrust is relied upon as an additional means of attack. Any such scientific use of the sword as is possible with the rapier is entirely precluded by its weight, consequently it has fewer combinations for attack and defense. Sword fencing consists of the cut, guard, and point, a combination equally available in the case of sword versus sword, and sword versus lance or bayonet.

The *singlestick* is a light ash rod or stick, used as a substitute for the sword, the exercises with which are identical.

Fencing in America. The most important fencing competitions in the United States are under the direction of the Amateur Fencers' League of America, which was organized in 1891 and is now affiliated with the Amateur Athletic Union. Four competitions are held each year, which are open to amateurs of all countries, viz.: (1) *American Championship:* With foils, dueling swords, and sabres; (2) *Foil Handicap:* One held by each division of the Amateur Fencers' League of America, at New York, and other centres; (3) *Team Championship:* With foils; teams consisting of three or four men; (4) *Junior Team Championship:* With foils; teams of three men, in which no man is allowed to participate who has ever won any A. F. L. A. foil medal. The intercollegiate championship is usually competed for by teams from the principal colleges and universities of the country; the Intercollegiate Fencers' Association, founded in 1894, includes Harvard, Yale, Columbia, Annapolis, Cornell, West Point, Pennsylvania, and Princeton. There are many important fencing clubs and organizations throughout the country, the most influential being the Fencers' Club of New York, founded in 1883. Philadelphia is regarded as the most important fencing centre next to New York, closely followed by Boston, San Francisco, Chicago, and St. Louis. The German-American athletic societies in every State of the Union also make fencing a prominent feature of their gymnasia, and more than any other factor maintain a strong interest in the development of broadsword and sabre work. The Fencing Section of the New York Turn Verein was founded in 1850; its first master was the afterward famous Franz Sigel.

Bayonet Fencing. The bayonet is a weapon made entirely for the thrust, consequently it is most effectually used when in the hands of an experienced user of the rapier. Of all forms of fencing, that with the bayonet is most exclusively military, yet curiously enough is only within quite recent times receiving the attention it has so long deserved; at a period, too, when in the opinion of many the opportunities for bayonet contact in actual warfare have been reduced to a minimum. The old form of bayonet exercise, like the old manual of arms, is now practically a thing of the past and is being everywhere superseded by bayonet attack and defense practice, in which bayonet is opposed to bayonet, and the modern principles of fence are employed. For gymnasium bayonet fencing, a spring bayonet is employed; so that, when contact is made in the thrust, the impact forces the bayonet back on its spring. When employed against the sabre, the bayonet is used on the same principle as the foil, except that, owing to its weight and form, only the more simple foil movements are possible; the two weapons are on fairly equal terms, however, as the sabre, from its weight and shape, is similarly situated. Whatever advantage the bayonet has in length, the sword has in general handiness. A bayoneteer usually engages in tierce or quarte, from which he is enabled to make a straight thrust, a disengagement, feint a straight thrust and disengage, or feint a disengagement into one line and disengage into another. The swordsman will parry with prime all straight thrusts and disengagements received *over* his blade, and with seconde those received *under the blade*. A greater variety of returns are possible, however, if tierce and quarte are employed to meet a thrusting attack at the breast. Against a dismounted swordsman, the bayoneteer will seek to keep the former outside his point, to secure which he will constantly threaten different parts of the swordsman's body and thus keep him on the defensive. On the other hand, the swordsman will aim to get inside the point of the bayonet, when by seizing the rifle with the left hand he has his opponent at his mercy.

Against a mounted swordsman the bayoneteer will centre his attack on the left or near side of the horseman and thus shorten the swordsman's reach. If opposed to a lancer (mounted), he will make his attack on the right or lance side and strive to get inside the point. Manuals of fencing for all fencing weapons, and particularly the foils and singlesticks, are plentiful. Consult: Hutton, *The Sword and the Centuries* (New York, 1901); Thimm, *A Complete Bibliography of Fencing and Duelling* (London, 1896); Czeipek, *Die Fechtkunst im Duell* (Gratz, 1897); Hergsell, *Die Fechtkunst im XV. and XVI. Jahrhundert* (Prague, 1896); Ristow, *Die moderne Fechtkunst* (ib., 1896); *Praktische Bajonett-Fechtschule nach der Bajonettir-Vorschrift für die Infanterie* (Berlin, 1889); Pollock and others, *Fencing, with a Complete Bibliography* (London, 1902); Pavese, *Foil and Sabre Fencing* (New York, 1905); Brock, "Fencing in America," in *Outing Magazine* (ib., 1912–13).

FENCING THE TABLES. A term applied in Scottish Presbyterian churches to the address before the administration of the Lord's Supper, setting forth who are "the worthy communicants" and warning others from partaking.

FEN'DALL, JOSIAS (c.1620–?). A proprietary and Colonial governor of Maryland from 1656 to 1660. He was born probably in England. He was one of Lord Baltimore's trusted agents in his Maryland colony, and as a reward for his services Lord Baltimore made him a large grant of land and commissioned him Governor. He was unable to enforce his authority, and was taken prisoner by the Puritan faction, but was released on taking oath that he would not interfere with the established government. Leaving Maryland, he proceeded to England, where he conferred with Lord Baltimore and acted as his adviser in his attempts to secure from Cromwell a recognition of his proprietary rights. In November, 1657, Fendall returned to Maryland as Governor. In the interregnum which followed the abdication of Richard Cromwell, Fendall seems to have deserted his former benefactor; for he placed his resignation in the hands of the Assembly and accepted from it a new commission as Governor. The newly established government, after a brief existence of six months, was again superseded by the proprietary, Philip Calvert being appointed Governor in place of Fendall, who was imprisoned. He was tried in the following spring (1661) and sentenced to be banished, but upon promising obedience was permitted to live unmolested until 1681, when, again being implicated in an insurrection, he was banished and his estates confiscated.

FEN'DER (from *fend*, abbreviation of *defend*). A device for protecting the sides of ships or boats from chafe or other injury. They are of numerous kinds. Rope fenders, made of large soft rope covered with canvas, are used for heavy boats, surrounding the hull just below the washboard. Cork fenders, much used on board modern vessels, consist of a closely plaited rope netting in the shape of a bag, filled with cork, and supported in place by a small rope. Heavy wooden fenders, which are merely solid cylindrical pieces of pine or other soft wood, are also common. They are 3 to 8 feet long and 6 inches to 1 foot in diameter; in some cases they are wrapped with old rope, old fire hose, or the like. During the Spanish War the desirability of coaling the United States ships at sea developed a special heavy class of fenders; the best of these were made of cotton bales, lashed with rope (which in some cases was covered with leather where likely to chafe) and supported from the deck by heavy rope slings. The large fenders now in use in the United States naval service are of somewhat similar size and shape, but are made of Spanish cane and are usually covered with a rope netting of very coarse mesh. These cane fenders are more resilient than the cotton bales, and are also much lighter and more easily handled, but they are not so durable.

FEN DISTRICT. See BEDFORD LEVEL.

FÉNELON, fā'n'-lōn', FRANÇOIS DE SALIGNAC DE LA MOTHE (1651–1715). A distinguished French author and prelate. He was born Aug. 6, 1651, in the Château Fénelon, Province of Périgord, in the present Department of Dordogne. He was the descendant of a family which has given many celebrities both to the church and to the state in France. His education was conducted at home up to his twelfth year. At a very early age he showed lively interest in the classics and especially in Greek. At the age of 12 he was sent to the University of Cahors, noted at the time for its classical course. Thence he was transferred to the famous Jesuit College Du Plessis in Paris. His success in his studies was remarkable, and at the early age of 15 he attracted the attention of the literary coterie of the Hôtel Rambouillet. At the close of a brilliant college career, when scarcely 20 years of age, he entered the Seminary of Saint-Sulpice, which, under the Abbé Tronson, was worthily fulfilling the purposes of its great founder, Olier. In 1675, at the age of 24, Fénelon received holy orders. He wished to enter upon mission work in Canada and, when that was impossible, in Greece. For some time after his ordination he was employed in attendance at the hospitals and in other parochial duties of the parish of Saint-Sulpice. In the year 1678 he was made director of the Nouvelles Catholiques, a community of women founded for the purpose of furthering the conversion of girls from Protestantism. While thus occupied, he formed an intimacy with Bossuet and took part in conferences on Holy Scripture held under his auspices. Fénelon looked up to Bossuet almost as a master. At this time, at the request of the Duchess of Beauvilliers, he wrote his book *De l'éducation des filles*, which was intended only for private circulation. It attracted so much attention, however, that it was given to the public in 1681. (There are several English translations, e.g., "On the Education of a Daughter," Boston, 1856.) The book has been called an anticipatory condemnation of Rousseau's *Emile*. The efficiency with which he discharged his duties as director led to his appointment as head of a mission, which, on the revocation of the Edict of Nantes in 1685, was sent to preach among the Protestant population of Saintonge and Poitou. Here his zeal and wisdom accomplished much in converting the inhabitants. He refused to allow force to be employed wherever his authority extended. In 1688 he resumed his duties in the Maison des Nouvelles Converties, and in 1689 was named by Louis XIV to the highly responsible post of preceptor of his grandson, the young Duke of Burgundy. Bossuet said that the position was a proper reward for merit that took the greatest pains to conceal itself. In this position Fénelon showed himself a great practical educator. While imparting the most varied knowledge, he knew how to prepare the mind and heart of his pupil for the great responsibility that was to be his as the destined ruler of France. He impressed upon him the great principles of truth and justice and the vanity of earthly glory, power, and happiness that are not accompanied by a sense of duty well done. In order to fulfill these lofty purposes to his satisfaction, Fénelon found himself under the necessity of composing his own textbooks. To this we owe many works still popular in educational use—the *Fables*, the *Dialogues des morts, Abrégé des vies des anciens philosophes*, and the preliminary sketch, at least, of *Télémaque*. There was also a translation of the *Æneid of Vergil*, and a *Vie de Charlemagne*, but unfortunately the first is lost, and the manuscript of the second was destroyed by fire at the burning of the archiepiscopal palace of Cambray in 1697. It was later charged that he had succeeded only too well, and made the Duke religious at the expense of manly vigor. In 1694 he was given the abbacy of Saint-Valéry in the diocese of Amiens and in the following year the archbishopric of Cambray. He accepted the archbishopric only on the condition that he should be allowed to live at his see the nine months of each year required by the canons, and that not even his duties as preceptor royal should interfere with this requirement. During his preceptorship he became acquainted with Madame Guyon (q.v.), a pious widow who was wont to give spiritual conferences to ladies of rank and who had written a *Short and Easy Method of Prayer*, a commentary on certain parts of the Bible, and several other mystical works in which she expounded her views regarding the inner life. Not long before the writings of Miguel de Molinos, the founder of the Quietists, had been condemned as heretical. (See Quietism; Molinos.) Molinos taught that perfect contemplation of God is a state wherein one neither reasons nor reflects, but passively receives the impression of heavenly light. In this mental inaction a soul neither fears hell nor desires salvation. The practice of the virtues of faith, hope, and love becomes unnecessary in this state, which Molinos called "quiet." Madame Guyon was not a professed follower of Molinos, but she favored his spiritual doctrine at least to the extent of teaching that in the state of perfect contemplation the soul resigns itself so entirely to the will of God as to care not whether it is to be damned or saved. She professed readiness to submit to the decision of the church, but her teaching was regarded as dangerous. Bossuet, with characteristic acumen, recognized the danger, but, with what cannot but be considered now as intemperate zeal, harshly condemned where gentle persuasion might have sufficed. From this time on, Bossuet and Fénelon were antagonists. Fénelon, convinced of the uprightness of Madame Guyon and her good intentions, defended her. In a book written during the controversy, called *Maximes des saints*, he showed the influence of Madame Guyon's teaching. After considerable delay 23 propositions from the maxims were condemned by the Pope, who rebuked the lack of moderation of some of Fénelon's opponents by adding, "He has erred through excess of Divine love, but you have erred through lack of love for your neighbor." Fénelon announced his condemnation to his own people at once and expressed his full submission. He seemed happy to give an example of docility and humility to his flock. Afterward he presented a golden ostensorium to his cathedral on which appeared the figure of the angel of Truth trampling on forbidden books. One of the titles in evidence was *Maximes des saints*. After this unfortunate episode Fénelon, who had been banished from the court, devoted himself entirely to the care of his diocese. The fame of his benevolence and enlightened charity spread far and wide. When the region about Cambray was invaded by the armies of Marlborough and Prince Eugène, those commanders gave strict orders to respect the estates of Fénelon, and in a time of great scarcity Marlborough provided a guard to protect the Archbishop's granaries. Notwithstanding these precautions, his valuable library was burned. In it were some of his precious manuscripts not yet given to the printer. Fénelon's only remark was, "I would much rather that this were destroyed than the cottage of some poor peasant." Fénelon fell into disgrace at court by reason of his *Télémaque*, which was regarded as a masked satire upon the King and his policies. The work had been printed from a copy surreptitiously obtained by the Archbishop's servant. Critics freely pointed out the characters presumably satirized. Sesostris was supposed to represent the Grand Monarch himself; Calypso, Madame de Montespan; Protesilaus, Louvois; and Eucharis, Mademoiselle de Fontanges. As Louis XIV fell into decline, there were hopes that Fénelon would be the Minister of the Duke of Burgundy when he should follow his grandfather to the throne. Fénelon even sketched a complete scheme of political reform, which he sent to the Duke, who still retained, in spite of the King's adverse influence and continued hostility, all his pristine affection for his former preceptor. Fénelon's political maxims were far in advance of the time. These hopes were disappointed by the premature death of the Duke in 1712. Fénelon survived him only until Jan. 7, 1715, dying in sentiments of the greatest piety and resignation to the Divine Will. Consult his works (23 vols., Paris, 1820–30) and his letters (11 vols., ib., 1827–29); *Lettres et opuscules inédits* (ib., 1850); selections from his letters have been published in English (New York, 1906, 1910); Bausset, *Vie de Fénelon* (3 vols., Paris, 1808); Crauslé, *Fénelon et Bossuet* (ib., 1895), in favor of the latter; Sanders, *Fénelon: His Friends and his Enemies* (London, 1901); Viscount Saint-Cyres, *François de Fénelon* (ib., 1901); Duclaux, *French Ideal: Pascal, Fénelon, and Other Essays* (New York, 1911).

FÉNELON, François de Salignac de la Mothe (1641–79). A French missionary in America, a half-brother of the great Fénelon. He entered the Order of Saint-Sulpice in 1664, and in 1666, when there came a request from Bishop Laval at Quebec for volunteer missionaries in the New World, Fénelon was one of the first to respond, and became an ardent and devoted missionary. In 1668 he established a Sulpician mission among the Cayugas on the Bay of Quinté on the north shore of Lake Ontario. On Easter Sunday, 1674, Fénelon preached a sermon at Montreal in which, in describing the ideal chief magistrate, he made a covert attack on Frontenac. The Sulpicians disclaimed responsibility for the sermon, but, the question of the privileges of their order being raised they defended him. Fénelon was summoned to appear before the council at Quebec, which hesitated to act, but Fénelon returned to France and was commanded by the King not to return to Canada. Consult Parkman, *Count Frontenac and New France* (Boston, 1877).

FEN'ELON FALLS. A town of Victoria Co., Ontario, Canada, on the Grand Trunk Railway, 16 miles north of Lindsay, between Cameron and Sturgeon lakes (Map: Ontario, F 4). Its name is associated with a picturesque waterfall 20 feet high and 300 feet wide. The manufacturing industries include flour mills, a saw and shingle mill, planing mills, boat building, and a woolen mill. The town owns its electric-light and power plants. It is a summer resort. Pop., 1901, 1132; 1911, 1053.

FEN'ESTEL'LA (Lat., little window). A fossil polyzoan found in rocks of Ordovician to Permian age and especially abundant in those of the Devonian and Lower Carboniferous series. The fragile colonies formed by the animals are fan-shaped or funnel-form, and when examined with a lens are seen to consist of radial branches that diverge from a common rootstock and that bear on their inner surfaces the minute cells in which lived the individual animals. These radial branches are joined by frequent horizontal threads that give rigidity to the network. See POLYZOA.

FENESTELLA (c.51 B.C.–19 A.D.). A Roman historian. He wrote a work of 22 books, entitled *Annales*, from which Plutarch derived some material for his *Lives* of distinguished Romans, and which was used as an authority by Asconius Pedianus in his commentaries on Cicero's orations, as well as by Pliny the Elder, Gellius, and Lactantius. The few fragments preserved relate almost exclusively to events subsequent to the Carthaginian wars. It is certain that it included the greater part of Cicero's career. There was much information on antiquarian matters. The *De Sacerdotiis et Magistratibus Romanorum*, which was formerly attributed to Fenestella, was the work of Fiocchi, a Florentine who lived during the fourteenth century. The fragments of the *Annales* are collected in Peter's *Historicorum Romanorum Fragmenta* (Leipzig, 1883). Consult: Mercklin, *De Fenestella Historico et Poeta* (Dorpat, 1844); Poeth, *De Fenestella Historiarum Scriptore* (Bonn, 1849); Peter, *Historicorum Romanorum Relliquiæ*, vol. ii (Leipzig, 1906).

FEN'ESTRA'TION. The arrangement, spacing, and proportioning of the windows, doors, and openings generally in the design of a building. The openings, of whatever character, are called the *voids*, as distinguished from the solids of walls and piers. Upon the fenestration depends in large measure the style and character of an architectural design, especially in its exterior aspect. In the warm southern climes the openings are relatively small and widely spaced; in cooler regions they are large and more closely spaced. Massive walls with infrequent openings produce an impression of dignity and solidity; greater richness is possible with larger openings and lighter masonry: compare the smiling palaces of Venice, with their grouped windows, with the sober and austere Strozzi Palace at Florence. Certain styles employ particular types of fenestration, as is exemplified by the pointed-arched, traceried windows of the Gothic styles, the round-arched openings of the Romanesque, Roman, Byzantine, and Renaissance styles, the horseshoe arches of the Moorish styles, and the four-centred arches of Persia. The Roman and Renaissance styles also used the rectangular form, framed in an architrave (q.v.) and often capped with a cornice or pediment. In monumental design generally, the openings are superposed —"void over void, solid over solid"—and symmetrically spaced with reference to a central opening on the axis or median line of a façade; but in less formal and more picturesque design, as in country houses, this rule is not necessarily followed. See WINDOW; ARCHITECTURE.

FENGHUANG (fŭng'hwäng') **CHENG.** A town of southern Manchuria about 45 miles northwest of Antung. Here the Japanese repulsed a Chinese assault Dec. 13–14, 1894. The town was occupied by the Japanese under Kuroki, May 6, 1904, in the pursuit of the Russians after the battle of the Yalu. See RUSSO-JAPANESE WAR.

FE'NIAN SOCIETY. A political association of Irish and Irish-Americans, the object of which was the emancipation of Ireland from British rule and the establishment of a republic. It has been said that the movement originated in America and was transplanted to Ireland; but, as a matter of fact, the plans for both the Irish and American organizations were drawn in Paris by a small group of the Irish revolutionary exiles of 1848.

The Irish Society was organized by the efforts of James Stephens, who in 1853 traveled through Ireland and organized the small centres of disaffection into a powerful conspiracy. It was necessarily secret, and known as the Irish Revolutionary Brotherhood (popularly called I. R. B.). Its aim was to convert the people of Ireland into a soldiery capable of resisting the British army. Stephens himself was the absolute military head, known as chief organizer (C. O.). He was assisted by four executive officers (one for each Irish province), known as "V's" (vice organizers) and chosen by himself. The "V's" selected "A's" (colonels), who in turn selected "B's" (captains) to choose and drill the "C's" (privates), who were all able-bodied men capable of bearing arms. The political programme of the Brotherhood contemplated the establishment of an independent republic based on universal suffrage and peasant proprietorship of the land. The possessions of hostile landlords were to be confiscated, and optional purchase was to be made at fair prices in other cases. Church property was to be confiscated, and the clergy were to be paid by the state. All religions were to be alike before the law.

The American society was organized at the same time by John O'Mahoney, according to the arrangements made in Paris, but did not obtain a really good footing until the arrival of Stephens in 1858. Its principal object was to supply money and arms to the Irish branch. In America the ability to bear arms was not a necessary qualification for membership. At the head was O'Mahoney, called the head centre, who appointed his own central treasurer, assistant treasurer, and central secretaries. He also commissioned State centres, on the recommendation of delegates from circles. The State centres commissioned district centres, who in their turn organized circles (local associations). The membership dues were nominal, but the society received large sums as voluntary contributions. The Fenian convention, which met in Chicago in October, 1863, made the constitution of the society more democratic by making the office of head centre elective. The growth of the Fenian Society was very rapid. The American branch quickly spread into Canada, and the Irish branch into western England and Scotland. The funeral of Terence McManus, an exile of 1848, who died in San Francisco, gave occasion for demonstrations of mourning in America and Ireland which greatly increased the number of Fenians. Two newspapers, the *Phœnix* in New York and the *Irish People* in Dublin, were the official organs of the society. The effort of the Fenians to win over Irish soldiers in the British army is claimed to have been successful, but this is denied. Being a secret society in Ireland, it necessarily fell under the ban of the Catholic hierarchy, although the lower clergy sympathized with and in some cases participated in the movement. In America the clergy were divided in sentiment.

The Civil War in the United States gave the Fenians a great opportunity to obtain military training. A large part of the Irish soldiers engaged on both sides in the struggle were Fenians, and at the end of the war there was a formidable number of trained soldiers ready to fight for Ireland. It was believed in Irish circles that a definite understanding existed between the Federal government and the head centre to the effect that after the war in America was ended the Fenians should receive material assistance. When the American officers went to Ireland to assist in drilling and leading the expected recruits, they found the organization not sufficiently advanced for active military measures.

Meanwhile the British government had kept itself informed of the movement by the aid of informers and spies. In 1865–66 it suppressed the *Irish People*, suspended the habeas corpus act, and caused several leaders of the Brotherhood to be sentenced to terms of penal servitude. Stephens escaped from prison and fled to America, where he was joyfully received by the American branch and made head centre. But the failure of the rising in Ireland and the uncertain fate of the Irish-Americans who were confined in British prisons caused dissensions, and he was deposed. At a convention held in Cincinnati, in September, 1865, William R. Roberts was chosen to succeed Stephens, a constitution similar to that of the United States was adopted for the projected Irish Republic, and preparations were begun for the invasion of Canada. A proposed expedition of 10,000 men resulted in 500 men crossing the Canadian border from New York and Vermont in 1866. They defeated the Canadian militia, but had to return to the United States on account of the failure of the organization to provide them with reinforcements and supplies. Their leaders were arrested by the American authorities. A daring attempt to seize the arms and ammunition stored in Chester Castle and convey them by ship to Ireland was thwarted in 1867. The general uprising in Ireland which was to follow the seizure was suppressed at every point. The rescue of two leaders by a band of Manchester Fenians resulted in the death of a police officer, for which three of the rescuers were hanged. The demolition of the wall of Clerkenwell prison and various Fenian threats threw the British authorities into a state of great alarm. Another attempt to raid Canada was suppressed by the United States government in 1871. This was the last effort of the Fenians.

The cause of the repeated failures of the Fenians is to be found in the fact that they had no real leaders. Stephens was a model organizer, but not a man of action. O'Mahoney was loyal to the order, but not a man of ability. There were endless dissensions among the leaders in both countries, besides much corruption, especially in the American branch. The dual organization in Ireland and America prevented harmony of action. But although they failed in their immediate object, their attempted uprising tended to convince English statesmen that it would be better to grant proposed reforms in Ireland than to be constantly engaged in suppressing revolts.

The name has been the subject of much discussion. O'Mahoney, who was a student of Old Irish lore, gave the name Fenian to the society. This name he derived from *Fionna Eirinn*, an ancient military organization which existed in Ireland, taking its name from Finn, the celebrated hero of Irish legend. Officially the name "Fenian" applied to the American branch only, but in the mind of the public it became connected with the entire movement. At first the Irish branch was popularly known as the Phœnix Society, owing to the aid Stephens received from the Phœnix Club, especially in counties Kerry and Cork. This club was suppressed by the government in 1858. The real name of the Irish branch was, as before stated, the *Irish Revolutionary Brotherhood.* Consult J. Gibbons, *Proceedings of the First National Fenian Convention Held at Chicago, 1863* (Philadelphia, 1863), and *The Government Proceedings against Fenianism* (London, 1865). The most detailed account of the movement is J. Rutherford, *Secret History of the Fenian Conspiracy* (2 vols., London, 1877), partisan English; A. M. Sullivan, *New Ireland* (Philadelphia, 1878), chaps. xvii–xxv, is partisan Irish, as is J. Savage, *Fenian Martyrs and Heroes* (Boston, 1864), the author of which was himself a Fenian. A good brief account of the movement, Irish in sympathy, is to be found in Justin McCarthy, *Ireland since the Union* (London, 1877), chaps. xiv–xvii. Macdonald, *Troublous Times in Canada* (Toronto, 1910), is the best account of the Fenian operations against Canada.

FENIN, fe-năN′, PIERRE DE (?–1506). A French chronicler, born in Artois. His chronicle was for a long time attributed to his father, another Pierre, who died in 1433. It consists of an account of the rivalry between the Armagnacs and the Bourguignons, from the murder of the Duke of Orléans (1407) to 1427. The second part is not in the old editions. It describes the first five years of the reign of Charles VII. The best modern edition of the *Mémoires de Fenin* is that by Mademoiselle Dupont (1837).

FENN, GEORGE MANVILLE (1831–1909). An English journalist and author, born at Westminster. He was early a contributor to *Chambers' Journal*, the *Star*, and *Once a Week;* became editor of *Cassell's Magazine* in 1870, and proprietor of *Once a Week* in 1873. He made himself known as the writer of a very extensive list of boys' stories, which have been circulated in many countries and have proved quite as popular in the United States as in England. Among these may be named: *Fix Bay'nets* (1899); *Charge: A Story of Briton and Boer* (1900); *Stan Lynn: A Boy's Adventures in China* (1902). In 1887 he produced a play, *The Barrister*, and in 1888 another, *The Balloon.* His publications include also several novels, such as *A Crimson Crime* (1899) and *The Cankerworm* (1901).

FENN, Harry (1838–1911). An American illustrator and aquarellist, born in Richmond (Surrey). He removed to the United States in 1857, lived there continuously after the early eighties, and was one of the founders of the American Water Color Society, where he exhibited annually. He was an able draftsman and was the suggester and chief illustrator of the publication *Picturesque America* (1872–74), which was epoch-making in the history of black and white illustration. He also contributed to *Picturesque Europe, Picturesque Palestine*, and *Egypt and Sinai;* furnished the well-known illustrations for Whittier's *Snow-Bound*, and worked for the leading magazines, especially *Harper's* and the *Century.* His drawings are spirited, of exquisite finish, and reveal delicate qualities of perception and feeling for nature. He was a lecturer on Oriental subjects, and received a gold medal at the Chicago World's Fair in 1893.

FENN, William Wallace (1862–). An American theologian, born in Boston. He graduated from Harvard University in 1884 (A.M.; S.T.B., 1887), and, entering the ministry of the Unitarian church, he held pastorates in Pittsfield, Mass. (1887–91) and Chicago (1891–1901). He was also lecturer on biblical literature at the Meadville Theological School (1892–1901, 1905–07) and preacher to Harvard (1896–98, 1902–05), and he became professor of systematic theology in Harvard Divinity School (1901) and dean (1906). He is author of *Lessons on Luke* (1890); *Lessons on Acts* (1894); *The Flowering of the Hebrew Religion* (1894); *Lessons on Psalms* (1900).

FEN'NEC (from Ar. *fanaka*, to remain in a place), or Zerda. The smallest of the canine tribe—a pretty little foxlike animal (*Canis*, or *Fennecus, zerda*) of the Sahara. It is about 15 inches long, besides the tail, which is nearly 7 inches in length and bushy like that of a fox. The general color is pale rufous cream, harmonizing with the desert sands; the breast, inside of the ears, and eyelids are white, and the tail is tipped with black. The erect ears are of enormous size—each as large as the face, giving a quaint air of intense alertness to the graceful little creature. It digs with remarkable speed a burrow in the sand, often escaping pursuit by fairly *diving* into the ground; and in its burrow, which is furnished with soft bedding and is remarkably clean, it sleeps most of the day, going abroad at dusk to steal cautiously to some drinking place and then to seek its prey, which consists of mice, small birds, lizards, insects, etc. The name is sometimes extended to related African species, such as Rüppell's fennec (*Canis famelicus*), the pale fox (*Canis pallidus*), and the asse (*Canis chama*) of the Transvaal. See Plate of Foxes and Jackals.

FEN'NEL (AS. *fenol*, from Lat. *fœniculum*, fennel, diminutive of *fœnum, fœnum*, hay), *Fœniculum.* A genus of umbelliferous plants allied to dill (q.v). The flowers are yellow. All the species are aromatic and have much-divided leaves with threadlike segments. The best known is common fennel (*Fœniculum vulgare*), a native of the south of Europe. It is a biennial, 3 or 4 feet tall, cultivated in many gardens in both Europe and America, chiefly for the sake of its leaves, which are used for flavoring, but also for its aromatic seeds. Florence fennel, sweet fennel, Italian fennel, or Cretan fennel (*Fœniculum dulce*) is of lower growth, much cultivated in the south of Europe. The enlarged bases of its leafstalks, after being bleached like celery, are boiled and served with drawn butter like cauliflower. The fruit (seed) is longer and paler than that of common fennel, has a more agreeable odor and flavor, is the favorite aromatic condiment of the Italians, and is used in medicine. Oil of fennel, an aromatic, stimulant, and carminative essential oil, is also made from it. Cape fennel (*Fœniculum capense*, or *Carum capense*), found in the vicinity of the Cape of Good Hope, has a thick, aromatic esculent root. The Panmuhoree of India (*Fœniculum panmorium*) is a species of fennel much cultivated in its native country for its sweet, warm, and aromatic fruit, which is much used as a carminative and in curries. The "giant fennel" of the south of Europe is a plant of a different genus (*Ferula*) and abounds in a fœtid juice. It is, indeed, closely allied to asafœtida. The species mentioned above, except *Fœniculum capense*, have recently been combined under the name *Fœniculum vulgare.* The plant called "fennel flower" is *Nigella damascena.* Dog fennel is *Anthemus cotula* and *Eupatorium capillifolium*, both of which belong to the family compositæ.

FENNEL (*Fœniculum vulgare*).

FENNEL FLOWER. See Nigella.

FEN'NELL, James (1766–1816). An English actor and writer, who went to America in 1793. He was born in London and was educated at Eton and Cambridge, but his extravagant habits ended his university career, and he undertook to support himself upon the stage. His first appearance was in Edinburgh, in 1787, as Othello, which remained a favorite rôle. In 1793 an invitation to play in Philadelphia brought him to the United States. For several years he acted successfully in the chief American cities, but his last years were spent in poverty and obscurity. Consult his *Apology for the Life of James Fennell* (Philadelphia, 1814).

FEN'OLLO'SA, Ernest Francisco (1853–1908). An American Orientalist and educator. He was born at Salem, Mass., and graduated from Harvard University in 1874. Removing to Japan in 1878, he was (between 1880 and 1886) professor of philosophy and political economy and of philosophy and logic in the University of Tokyo; became professor of æsthetics and manager of the Tokyo Fine Arts Academy; and for a time was Imperial finearts commissioner and manager of the Imperial Museum of Tokyo. He returned to the United States in 1890 and was for six years curator of the Oriental department of the Boston Museum of Fine Arts. In 1897 he accepted the professorship of English literature at the Imperial Normal School at Tokyo. In 1890 he was decorated by the Mikado with the third-class Rising Sun and with the third-class Sacred Mirror. He is author of *East and West: The Discovery of America and Other Poems* (1893); *An Outline History of the Ukiyos-ye* (1901); *Epochs of Chinese and Japanese Art* (2 vols., 1911; 2d ed., 1912).

FEN'RIR (Icelandic, probably connected with *fen*, quagmire, swamp, sea; cf. Eng., fen). In Norse mythology, the offspring of Loki (the evil genius) and Angurboda (anguish-boding), a giantess from Jötunheim. Loki had a legitimate wife, Sigyn; but by Angurboda he became the father of three monsters: (1) the wolf Fenrir; (2) the Midgard Serpent; (3) Hel, the Goddess of Death. Fenrir was bred among the gods, but only Tyr had the courage to give him food. When the gods saw how much he increased daily and remembered that the predictions were that he was destined to be their destruction, they endeavored to chain him. But he easily broke the first two chains. Then they made a third, Gleipnir, composed of the sound of a cat's footsteps, a woman's beard, the roots of a mountain, a fish's breath, and a bird's spittle. Fenrir suspected some trick in this, and was unwilling to be bound unless one of the gods should place his hand in the wolf's mouth as a pledge of good faith. Finally Tyr consented to do this, and the wolf in his vain struggles to break the chain bit off Tyr's hand. Fenrir could not break the magic chain and became a captive to the gods, who took him to the cave Gjöll and put a sword into his jaws. Out of these flows the river Von. Fenrir will remain in the cave until Ragnarök (the end of time) comes. He will then break loose, his upper jaw will touch heaven, his nether jaw the earth; fire will blaze from his eyes and nostrils. In the tremendous tumult which precedes the general dissolution the wolf will swallow Odin (father of gods) and so cause his death. But at the moment will come Vidar, the silent god, who wears a wonderful shoe made from shoe parings since time began. With that shoe he will hold down Fenrir's lower jaw and with his hands tear off the upper jaw, and thus will the monster wolf be slain. According to Völuspa, from Fenrir are descended Skoll and Hati, the monsters that are to devour the sun and moon; elsewhere in the Edda Fenrir himself is spoken of as the devourer of the sun. See Scandinavian and Teutonic Mythology.

FEN'TON. See Stoke-upon-Trent.

FENTON, Elijah (1683–1730). An English poet, born at Shelton, Staffordshire. He studied at Jesus College, Cambridge, and became secretary to the Earl of Orrery in Flanders. Subsequently he was head master of the grammar school at Sevenoaks (Kent), instructor in literature to Craggs, the Secretary of State, and tutor to Lord Broghill, son of the Earl of Orrery. With Broome he assisted Pope in the latter's translation of the *Odyssey*, executing the first, fourth, nineteenth, and twentieth books in so clever an imitation of Pope's manner that his share cannot be distinguished by any internal test. He wrote a tragedy, *Mariamne*, presented in 1723, and published a collection of poems (1707), and editions of Milton, and of Edmund Waller (1729). Consult W. W. Lloyd, *Elijah Fenton; His Poetry and Friends* (1894).

FENTON, Ferrar (1832–). An English Orientalist, born in Waltham, Lincolnshire. He early became a proficient linguist and led a remarkable life, being at one time a factory operative and at another one of the originators of the De Beers Company, the South African Diamond Mines monopoly. Beginning with 1884, when he published *St. Paul's Epistles in Modern English*, he brought out from time to time versions of different parts of the Bible "in modern English."

FENTON, Reuben Eaton (1819–85). An American politician. He was born at Carroll, N. Y., studied law, was admitted to the bar in 1841, and practiced for a time at Jamestown, N. Y., but afterward gave up the profession of law and became a merchant. He was a Representative in Congress in 1853–55 and in 1857–65, and was then Governor of New York until 1869, serving two terms. During the Civil War he was a stanch supporter of the war measures of Lincoln and his cabinet. He was a United States Senator from 1869 to 1875 and in 1878 was chairman of the United States Commission at the International Monetary Conference at Paris.

FEN'UGREEK (AS. *fenogrecum*, from Lat. *fœnum Græcum*, Greek hay), *Trigonella*. A genus of plants of the family Leguminosæ, allied to clover and melilot. The leaves have three obovate leaflets and scythe-shaped stipules. The flowers generally have the keel very small so that the wings and standard present the appearance of tripetalous corolla. The common fenugreek (*Trigonella fœnum-græcum*) is an annual, native of eastern Europe and western Asia, naturalized in the Mediterranean region, where, as in India, it has long been cultivated as a fodder plant and for its strong-smelling, oily seed, which is used in Egypt and the East in bread and curry powder. In medicine it is now used only in external applications, but is employed in veterinary practice as an ingredient in condition powders. It is the common flavoring substance of patent stock foods, which owe their strong, not unpleasant, odor to it.

FEN'WICK, George (c.1603-57). An English parliamentary leader and colonist in America. He studied law, was called to the bar at Gray's Inn in 1631, and became one of the patentees of the Connecticut Colony in 1635, visiting Boston in the following year. In 1639 he removed with his family to Saybrook, Conn., where he represented the patentees and held the office of Governor until 1644. In 1645 he disposed of most of his property at Saybrook and returned to England, where in the same year he was chosen to the Long Parliament from Morpeth. He served in the Civil War as a colonel of militia and became Governor of Berwick after its fall in 1648. He was one of the parliamentary commissioners for the King's trial, but did not act. He was with Cromwell in his invasion of Scotland in 1650 and, after serving as Governor of Edinburgh Castle, became in 1651 one of the commissioners for the government of Scotland. He was a member of the parliaments of 1654 and 1656 from Berwick.

FENWICK, or **FENWICKE,** John (1618-84). An English Quaker colonist in New Jersey. Acting in conjunction with, or as a trustee for, Edward Byllynge (q.v.), he bought for £1000 the interest of Lord Berkeley in the Province of New Jersey, in March, 1673, and two years later led the company of Quakers which emigrated from England in the ship *Griffin* and founded Salem, N. J., the first English settlement in West Jersey. He and Byllynge soon became involved in a dispute over the extent of their respective shares in the purchase, but an adjustment was made by William Penn, who was called in as arbitrator, and who awarded one-tenth of the territory to Fenwick and the remainder to Byllynge. Fenwick, however, soon executed a contingent lease for 1000 years to John Eldridge and Edward Warner, and the property eventually passed out of his hands. After his arrival at Salem a controversy arose between him and Governor Andros of New York over the question of jurisdiction, and late in 1676 he was arrested, taken to New York, and forced to give his parole that he would not assume any authority on the east side of the Delaware River until regularly authorized to do so by Andros or the Duke of York. Consult *Narratives of Early Pennsylvania, West New Jersey, and Delaware,* ed. by A. C. Myers (New York, 1912).

FENWICK, Sir John (c.1645-97). An English conspirator, the eldest son of Sir William Fenwick, of Wellington Castle. He served in the army and was advanced to the rank of major general in 1688. From 1677 to 1687 he served in Parliament. It was he who brought up the bill of attainder against the Duke of Monmouth in 1685. After the accession of William III, for whom he had a personal dislike—due, says Macaulay, to a reprimand from the Prince of Orange—he remained an ardent Jacobite and was involved in numerous plots against the King. He entered into the conspiracy known as the Assassination Plot (1695) and in the following year was arrested and committed to the Tower. His family connections and political backing might have brought him a pardon, had he not tried to implicate Marlborough, Godolphin, Shrewsbury, and other Whig leaders. A bill of attainder was passed against him, with a very small margin of votes to spare. He was beheaded on Tower Hill on Jan. 28, 1697, being the last person executed in England in consequence of attainder.

FÉNYES, fā'nyĕsh, Alexius (1807-76). A Hungarian geographer and statistician. He was born at Csokály (County of Bihar) and was educated at Grosswardein and Pressburg. After spending two years at Budapest and in European travel, he succeeded in collecting reliable data for his standard geographical and statistical works on Hungary. In 1835 he became permanently established at Budapest, where his principal works were written. These include a voluminous historical and geographical report on the contemporaneous conditions of Hungary (1836-39), for which work 200 ducats were awarded by the Learned Society of Hungary; *Magyarország Statistikája* (2d ed., 1844); and a school atlas of Hungary. In 1848 Fényes was appointed chief of statistics in the Ministry of the Interior.

FEODOR, fā'ō-dôr, Feodorovitch. See Bure, Friedrich Wilhelm Rembert.

FEODOSIA. See Kaffa.

FEOFFMENT, fĕf'ment (OF. *feoffement,* from *feoffer, fieffer, feffer,* to enfeoff, from *fief, fien, fen, fied, fee,* from ML. *feudum,* property held in fee, from OHG. *fihu,* Ger. *Vieh,* AS. *feoh,* Goth. *faihu,* cattle; connected with Lat. *pecus,* Skt. *pasu,* cattle). The oldest, and for a long period the only, method for the conveyance of freehold land known in England. It was a ceremonial mode of conveyance which rested upon and was derived from the primitive notion that an actual physical transfer of possession is essential to the transfer of title. It consisted in the formal conveyance of the land from the feoffor to the feoffee, the former stating distinctly the measure of the estate conferred, whether it was in fee, in tail, or for life. This conveyance of the land, in order to be complete, required to be accompanied by livery of seisin ("delivery of possession").

Livery of seisin was of two kinds—by deed and in law. In the former case, the parties being actually upon the land, the feoffor, usually by delivery of a twig or a turf, testified his conveyance of the land. In livery in law, the parties being in sight of the land, the feoffor, referring to the land, gave possession to the feoffee by indicating or describing the parcel to be conveyed. This mode of making livery was ineffectual unless the feoffee entered into possession during the life of the feoffor. Livery in deed might be effected by attorney, but livery in law only by the parties themselves. In the earliest times these ceremonies completed the conveyance. But by degrees the practice of embodying the transaction in a deed was introduced. When a deed was used, it was customary to indorse on the deed the fact that livery of seisin had been made. But it was still the livery and not the deed which effected the conveyance. By the Statute of Frauds (29 Car. II, c. 3) it was declared that no estate created by livery of seisin, unless accompanied by a writing signed by the party or his agent, should be of any effect, except as an estate at will, and by 8 and 9 Vict., c. 106, 3, a feoffment is void unless accompanied by deed.

The law formerly gave so great an effect to a feoffment that even when the party ostensibly making the conveyance was not lawfully seised of the estate, the feoffment was sustained. This was called a tortious conveyance; the party in whose favor it was made was said to have acquired an estate by wrong, the rightful owner was disseised, and was left to his right of entry (q.v.). But by the statute last mentioned this tortious effect of a feoffment was destroyed. The practice of feoffment above described, and which has existed in England from time immemorial, differed materially from the old form of investiture in use in strictly feudal times and from that which still prevails in Scotland. In England the transaction was simply a conveyance by the actual holder of the land to a new tenant, attended by certain ceremonies, but requiring no confirmation by a third party to complete it. But by feudal usage every holder of land was the vassal of some superior lord, to whom he owed suit and service and without whose consent he could not part with his land; hence no conveyance was complete without the reception of a new tenant by the lord paramount as his vassal. In like manner, to this day, in Scotland, no transfer of a heritage is complete without formal confirmation by the superior; and although by recent legislation the old feudal usages have been abolished, yet the fact of acceptance by the superior, and the performance of the pecuniary services attendant on that acceptance, are still preserved. See CONVEYANCE; FEE; FEUDALISM.

FE′RÆ (Lat. nom. pl., wild). In the Linnæan system of zoölogy, an order of mammals including nearly all of the modern order Carnivora, plus several genera now ranked under the Insectivora and Marsupialia. In modern zoölogy the term is little used.

FE′RÆ NATU′RÆ (Lat., animals of "wild nature"). In law, animals of wild nature and habits, in contradistinction to domesticated animals. At common law, they are not the subjects of absolute property, and persons having them in possession are bound at their peril to keep them from doing harm. A qualified property in them may be gained by taming or confining them, or by reason of owning the land on which are their habitual resorts, or by reason of their inability to wander from such land, or by reason of an exclusive legal privilege of hunting, taking, and killing them. Even in such cases, if the animals escape from the possession of the qualified owner or from his land, and are thus at liberty in accordance with their wild nature and habits, the qualified property ceases, and any stranger may take them without incurring any liability to the possessor. In accordance with this doctrine it is held that, if a swarm of bees fly from the owner's land, they remain in his possession so long as he keeps them in sight and is able to possess them; but if they escape from his pursuit and light upon the land of another, the latter may hive and keep them. It is also held that a landowner has a qualified property in a swarm of wild bees in his woods, and a stranger can acquire no title to them by finding and taking them there without such owner's consent. Wild animals once in captivity do not regain their natural liberty so as to become subject to capture in case they have become so far domesticated as to have formed the habit of returning.

The liability of a person who has in his possession animals *feræ naturæ* is virtually that of an insurer of the safety of others against harm from such animals. It has been held, therefore, that one who keeps an elephant does so at his own risk, and an action can be maintained for an injury done by it, although the owner had no knowledge of its mischievous propensities. Consult: the *Commentaries* of Blackstone and Kent; also Darlington, *On Personal Property* (Philadelphia, 1891); Schouler, *Treatise on the Law of Personal Property* (3d ed., Boston, 1896).

FERAMORZ, fĕr′à-môrz. The young poet in Moore's *Lalla Rookh* (q.v.).

FÉRAUD-GIRAUD, fā′rō′-zhē′rō′, LOUIS JOSEPH DELPHIN (1819–). A French jurist, born at Marseilles. He studied at the University of Aix, and became a judge in that city in 1851. In 1878 he was appointed a councilor of the Court of Cassation. He published several legal works, including: *Servitudes de voirie* (1850–52); *Traité de la grande voirie et de la voirie urbaine* (1865); *Occupation militaire* (1881); *Code des mines et des mineurs* (1887); *Etats et souverains* (1895); *Traité des voies rurales publiques et privées et servitudes rurales de passage enclaues* (1896).

FER-DE-LANCE, fâr′de-läns′ (Fr., iron of the lance). A tropical American venomous snake (*Lachesis lanceolatus*) of extraordinary virulence. It is a pit viper, or crotalid, of the subfamily Lachesinæ, and hence closely related to the northern copperhead, the bushmaster (qq.v.), and others of South America and Indo-Malaysia. It resembles a rattlesnake, but has a tapering tail ending in a hard point (hence one name is "rat-tailed viper"), not rattle; reaches a length of 7 feet, and is reddish-yellow brown, marked with a black stripe from the eye to the neck, and irregular dark crossbands; sometimes the sides are bright red. It inhabits nearly all South and Central America and is everywhere dangerously abundant, being remarkable fecund. It is greatly dreaded, especially at night, when it wanders about. During the day it lies coiled in the fields and roadside herbage and, unlike almost all other snakes, will attack without warning or waiting for disturbance. Its bite is very likely to prove fatal, and even when the patient recovers it produces long-continued aftereffects. The snake is of service, on the other hand, in keeping down rats, etc., destructive to sugar cane. It is most conspicuous in the French Antilles, where alone it is known by this name. Its introduction to the islands of the mongoose (q.v.), in the hope that it might thus be exterminated, has proved useless. The best account of the fer-de-lance is that by Ruz, *Enquête sur le serpent de la Martinique* (Paris, 1859). Consult also Gadow, *Amphibia and Reptiles* (London, 1901), and Ditmars, *Reptiles of the World* (New York, 1910).

FER′DINAND I (1503-64). Holy Roman Emperor from 1556 to 1564. He was born at Alcalá, Spain, March 10, 1503, and was the second son of Philip the Handsome of Austria and of Joanna the Mad (daughter of Ferdinand V of Aragon and Isabella of Castile and León), and was consequently the younger brother of Charles V of Germany (Charles I of Spain), who soon after his accession to the Imperial throne transferred the hereditary Austrian possessions of the Hapsburgs to Ferdinand. In 1521 he married Anna, sister of King Louis II of Hungary and Bohemia. When Louis fell at Mohács in 1526 in battle with the Turks, leaving no issue, the crown of Hungary was claimed by Ferdinand in right of his wife, and some of the nobles chose him King. He was at the same time placed by election upon the Bohemian throne. In Hungary Ferdinand became involved in a long struggle with a rival, John Zápolya, the Voivode of Transylvania, who laid claim to Hungary, and who was supported by the Turks. The question was at last settled in 1538 by a division of the kingdom between the rivals, the title of King being given to Zápolya, but with the understanding that the Austrian line should have the succession to the whole. But in 1540, at the death of John Zápolya, the agreement was not kept, and the Turks carried on the war on behalf of his son Sigismund, while they themselves appropriated a large part of the kingdom. In 1547 peace was purchased by means of a yearly tribute to the Turks, but the war was again renewed in 1552 and ended in the retention of their conquests by the Turks. Meanwhile Ferdinand had acted as regent in Germany during the frequent absences of Charles V and in 1531 had been chosen King of the Romans. In 1552 he acted as mediator between Charles V and Maurice, Elector of Saxony, and concluded the Peace of Passau with the Protestants, and in 1555 he was chiefly instrumental in bringing about the religious Peace of Augsburg. In 1556, on the abdication of Charles V, Ferdinand mounted the Imperial throne. The concessions he had made to the Protestants caused Pope Paul IV to refuse to acknowledge him. His successor, Pius IV, was more complaisant; but the Electors resolved that for the future the consent of the Pope should not be asked; and this was carried out. Ferdinand made several attempts to reconcile the Protestants and Catholics and urged upon the Council of Trent the reformation of abuses. He effected institutional reforms, notably in connection with the Aulic Council (q.v.), and he reformed the German currency. He died in 1564, leaving the reputation of a prudent and enlightened ruler, and was succeeded by his son, Maximilian II. The most elaborate work on his reign is F. B. von Bucholtz, *Geschichte der Regierung Ferdinands I.* (Vienna, 1831–38). Consult also: K. Oberleitner, *Oesterreichs Finanzen und Heerwesen unter Ferdinand I.* (ib., 1859); A. Rezek, *Geschichte der Regierung Ferdinands I. in Böhmen* (Prague, 1878); Rosenthal, *Die Behördenorganisation Kaiser Ferdinands I.* (Vienna, 1887); W. Bauer, *Die Anfänge Ferdinands I.* (ib., 1907). See AUSTRIA-HUNGARY; GERMANY.

FERDINAND II (1578–1637). Holy Roman Emperor from 1619 to 1637. He was born at Gratz, July 9, 1578, and was the son of Charles, Duke of Styria, and grandson of the Emperor Ferdinand I. His mother, Mary of Bavaria, was a fervent Catholic, and from her, as well as from his Jesuit instructors at Ingolstadt, he imbibed that hatred of Protestantism which is the keynote to the policy of his reign. In 1590 he succeeded his father in the duchies of Styria, Carinthia, and Carniola. As soon as he was of age he proceeded to stamp out Protestantism in his dominions by annulling his father's act of toleration and expelling the Protestant pastors. He joined with Maximilian of Bavaria in forming the Catholic League, the ostensible object of which was the protection of the Roman Catholic interests in Germany. In 1617 Ferdinand was crowned King of Bohemia, while the Emperor Matthias was still reigning, and the year following he was crowned King of Hungary as well. The Protestants of Bohemia had enjoyed religious toleration since 1609, but Ferdinand, as regent of the kingdom, showed little regard for the rights of his heretical subjects. A dispute regarding the right of the Protestants to build new churches precipitated a conflict. All petitions to the Emperor proving vain, the Protestants under Count Thurn rose in Prague in May, 1618, invaded the council chamber of the castle, and threw two members of the Council of Regency, Martinitz and Slavata, out of a lofty window. They then organized a national government, and a Bohemian army under Count Thurn advanced to the Austrian frontier. This was the beginning of the Thirty Years' War (q.v.). The death of Matthias early in 1619 left the Imperial succession open to Ferdinand, but at this juncture he was besieged in Vienna by the victorious Thurn. The opportune victory of Bucquoi over Mansfeld and the approach of a force under Dampierre caused Thurn to withdraw, and Ferdinand was able to proceed to Frankfort and receive the Imperial election, August, 1619. Two days before his election he had been deposed in Bohemia and the crown offered to Frederick V (q.v.), Elector Palatine of the Rhine. This prince, who was son-in-law to James I of England, accepted the dignity, but was ousted from his new dominions by the army of the Catholic League under Tilly, which won the battle of the White Mountain, near Prague, November, 1620.

As soon as his success in Bohemia was assured, Ferdinand proceeded to extirpate Protestantism in that kingdom by the most violent persecution. In Hungary, however, he was forced to grant religious toleration and to recognize Bethlen Gábor as ruler of half the kingdom. In 1626 Wallenstein took the field with a vast army which he had raised for the Emperor, whose main reliance in the war against the Protestants had hitherto been the army of the Catholic League, under Tilly, and the forces of Spain. In 1625 Christian IV of Denmark took up arms for the German Protestants. The victories of Wallenstein and Tilly made the Catholic cause for the King triumphant, and Denmark was forced to the Peace of Lübeck in 1629. This was followed by Ferdinand's Edict of Restitution, which was to apply to all ecclesiastical property which had become Protestant since the Peace of Passau (1552). But the plans of Ferdinand for reconverting the Empire to Roman Catholicism were suddenly checked by the irruption of Gustavus Adolphus, King of Sweden, in whom the Protestants found a deliverer. He landed in Germany in 1630, at the moment of the dismissal of Wallenstein through jealousy on the part of the Catholic League. Ferdinand had the mortification of seeing the whole of Germany overrun by the Protestants, and though Gustavus was slain at Lützen, in 1632, in a great battle against Wallenstein (who had been reinstated), the disasters to the Imperial cause continued. A blot on Ferdinand's character was the assassination of Wallenstein (q.v.) in 1634, to which there is little doubt the Emperor was privy. Though the Imperial army was victorious at Nördlingen in 1634, and the Elector of Saxony made peace with the Emperor, yet when Ferdinand died, Feb. 15, 1637, he left a heritage of war to his son, Ferdinand III, who had been chosen King of the Romans the year previous, and who had been previously crowned King of Hungary and Bohemia. Consult Hurter, *Geschichte Kaiser Ferdinands II. und seiner Eltern*

(Schaffhausen, 1857–64). See AUSTRIA-HUNGARY; GERMANY.

FERDINAND III (1608–57). Holy Roman Emperor from 1637 to 1657. He was the son of Ferdinand II and was born at Gratz, July 13, 1608. In 1625 he was crowned King of Hungary and in 1627 of Bohemia as well. After the death of Wallenstein (1634) Prince Ferdinand was placed in nominal command of the Imperial forces, and in the same year, seconded by Gallas, he gained a great victory at Nördlingen over the Swedes and their allies. In 1636 he was crowned King of the Romans and the next year succeeded his father as Emperor. Political reasons forced Ferdinand to continue the war, in which the French had become important factors, but in 1648, after negotiations extending over many years, the Peace of Westphalia (q.v.) put an end to the Thirty Years' War. In the Diet of that year, the last presided over by an emperor in person, Ferdinand effected important alterations in the administration of justice. He died April 2, 1657, shortly after concluding an alliance with Poland against Sweden. His son, Leopold I, succeeded him in the Empire as well as in the Austrian possessions and Hungary. Consult Koch, *Geschichte des deutschen Reichs unter Ferdinand III.* (Vienna, 1865–66). See AUSTRIA-HUNGARY; GERMANY; THIRTY YEARS' WAR.

FERDINAND I, surnamed THE JUST (1379–1416). King of Aragon from 1412 to 1416. He was the younger son of John I of Castile and Leonora of Aragon. On the death of his elder brother, Henry III, in 1406, he refused the crown of Castile, but undertook the office of regent during the minority of his nephew, John II. In this capacity he distinguished himself by his prudent administration of home affairs and by his victories over the Moors by land and sea. He took the title *de Antequera* on the surrender of that fortress after a siege of five months (1410). On the death of his maternal uncle, King Martin of Aragon and Sicily, in 1410, his claims to the throne, though not derived through the usual laws of descent, were taken up and keenly pressed by a powerful party in the state. The question of the succession was ultimately referred to a committee of nine judges, equally representing Catalonia, Valencia, and Aragon, and the result was his election by a majority in 1412. After he had defeated Count Jacme of Urgel, the last and most formidable of his rivals, he was formally crowned at Saragossa in 1414. He died April 2, 1416, at Igualada, and was succeeded by his son, Alfonso V. Consult Burke, *History of Spain*, vol. i (New York, 1904), and Altamira, *Historia de España*, vol. i (Barcelona, 1900).

FERDINAND II. King of Aragon. See FERDINAND V OF CASTILE.

FERDINAND I, *Ger. pron.* fĕr′dê-nänt (1793–1875). Emperor of Austria from 1835 to 1848. He was the eldest son of Francis I by his marriage with Maria Theresa, of the house of Naples, and was born in Vienna, April 19, 1793. While Crown Prince, he traveled through the Italian provinces of Austria, Switzerland, and part of France, and showed great interest in the various branches of industry. In 1830 he was crowned King of Hungary, and in 1831 married Anna, the daughter of Victor Emmanuel I, King of Sardinia. An unsuccessful attempt to assassinate him was made by a Captain Reinol in 1832. In 1835 he succeeded his father on the throne. It was expected that he would inaugurate a more liberal policy than that of his predecessors; but the absolutist principles triumphed, and Metternich was allowed to carry on the government. A council of state was formed, and reactionary measures continued. Industrial and commercial activity was encouraged, however, and the term of military service reduced from 14 to 8 years. In 1846 advantage was taken of the insurrection in Galicia to annex Cracow to Austria. In March, 1848, Vienna became the scene of a revolutionary outbreak (see AUSTRIA-HUNGARY), and the Emperor was forced to dismiss Metternich, who fled from Vienna, and to appoint a responsible ministry. Simultaneously a revolutionary movement at Pesth secured the appointment of a national Hungarian ministry. In May Ferdinand retired with his court to Innsbruck, but was induced to return to the capital in August, when the turmoil had subsided. But the October insurrection in Vienna made him again leave the palace of Schönbrunn and retire to Olmütz, where, on Dec. 2, 1848, he abdicated in favor of his nephew, Francis Joseph. He afterward resided at Prague, where he died June 29, 1875. Consult Stiles, *Austria in 1848–49* (New York, 1852), from Kossuth's point of view.

FERDINAND I, KING OF BULGARIA (1861–). He was born in Vienna, the youngest son of Prince Augustus of Saxe-Coburg and Princess Clementine of Bourbon-Orléans, a daughter of Louis Philippe. He received an excellent education and showed a marked aptitude for the study of natural history. The results of his botanical observations on a trip which he made to Brazil in 1879 were published at Vienna (1883–88). While serving in the Austrian army, he was offered in 1886 the vacant throne of Bulgaria, and on Aug. 14, 1887, took the oath to the constitution and the title of Prince. Although thoroughly acceptable to his subjects, he was not recognized by Turkey or the Great Powers until 1896. In 1893 he married Marie Louise of Bourbon, eldest daughter of Duke Robert of Parma, and the next year the Bulgarian Sobranye confirmed the title of Royal Highness to the Prince and his heir. Ferdinand continued to adhere to the Roman Catholic faith, but his son and heir, Prince Boris (born 1894), was received in 1896 into the Orthodox church. In 1908 Prince Ferdinand took as second wife Eleanor, a princess of the house of Reuss, and in the same year, taking account of the increased prosperity of his country and of the difficulties, foreign and domestic, which beset Turkey, he proclaimed the full independence of Bulgaria and assumed the title of King. His royal title was recognized by Turkey and the Powers in 1909. Ferdinand favored the formation of the Balkan League and the prosecution of the Balkan War (q.v.) of 1912–13. In the first period of that struggle the prowess of Bulgarian arms was such as to enhance the King's prestige, but the lamentable quarrel of Bulgaria with her former allies and the pitiable collapse of his country in the consequent second phase of the war discredited Ferdinand, both at home and abroad. Although by the final settlements of 1913 his kingdom had been materially enlarged by the incorporation of part of Thrace, including some 60 miles of seacoast on the Ægean, Ferdinand was deeply chagrined that a relatively larger territory had not been secured, and he even considered abdication. Consult John Macdonald, *Czar Ferdinand and his People* (London, 1913). See BULGARIA, *History*.

FER'DINAND I (?–1065). King of Castile and León, surnamed The Great. He was the second son of Sancho the Great of Navarre, and in 1033, when Sancho forced Bermudo III of León, the last direct descendant of Pelayo, in the male line, to surrender Castile, Ferdinand received that kingdom, together with Bermudo's sister Sancha in marriage. Bermudo, shortly after Sancho's death, sought to recover his lost possession but was defeated and slain (1037). Ferdinand, now King of León as well as of Castile, by a conciliatory though firm policy, established his authority over his conquered subjects, and when his domains were invaded by his brother, Garcia IV of Navarre, the attack resulted in the death of the latter on the battlefield of Atapuerca, near Burgos, in 1054, and the annexation of a large portion of his dominions. At an early period of his reign Ferdinand began to direct his energies against the Moors and by a series of successful campaigns carried the Christian arms as far as the Mondego and reduced the emirs of Toledo, Saragossa, and Seville to subjection. He died at León, on Dec. 27, 1065, after having divided his dominions among his children. Ferdinand laid claim to the title of Emperor of Spain, a claim to which the Emperor Henry III of Germany objected, appealing in 1055 to Rome. According to a very doubtful tradition, a decision favorable to Ferdinand's Imperial pretensions, so far as they related to the territories which had been conquered from the Moors, was given, chiefly in consequence of the representations made by the famous Cid, Ruy Diaz de Bivar. Ferdinand effected many reforms, both in secular and ecclesiastical matters, and was very liberal to the church. Consult Burke, *History of Spain*, vol. i (New York, 1904), and Altamira, *Historia de España*, vol. i (Barcelona, 1900).

FERDINAND II (?–1188). King of León from 1157 to 1188. The death of his brother, Sancho III of Castile, in 1158, led to a military occupation of Castile by Ferdinand, professedly in the interests of his nephew, Alfonso III, but this occupation lasted only a short time. Meanwhile Ferdinand repudiated his wife, Doña Urraca, and became involved in a war with his father-in-law, Alfonso I of Portugal, which resulted in the defeat and capture of the latter at Badajoz, in 1169. He died in 1188 and was succeeded by his son, Alfonso IX. Consult Burke, *History of Spain*, vol. i (New York, 1904).

FERDINAND III (1199–1252). A king of Castile and León, usually known as St. Ferdinand. He was the son of Alfonso IX of León and of Berengaria, sister of Henry I of Castile. On the death of Henry, without issue, in 1217, Berengaria procured the proclamation of Ferdinand. In 1230, on the death of his father, he became King of León as well as Castile, thus finally uniting the two kingdoms under one crown. Following up the advantages which had been gained for the Christian arms by his father and the allied kings in the great battle at Las Navas de Tolosa, in 1212, he devoted all his energies to the prosecution of the Moorish War. Among his conquests may be mentioned those of Cordova in 1236, of Jaén in 1246, and of Seville in 1248. He was planning an invasion of Africa when he died, at Seville, leaving his kingdom to his eldest son, Alfonso X. Though not canonized until 1668, he came to be popularly known as *el Santo* from a very early period, for his remarkable religious zeal. He laid the foundation of *Las Siete Partidas*, the legal code of Christian Spain, which was completed by Alfonso X (q.v.). Consult Altamira, *Historia de España*, vol. i (Barcelona, 1900), and Burke, *History of Spain*, vol. i (New York, 1904).

FERDINAND IV (1285–1312). King of Castile and León from 1295 to 1312. He was the son of Sancho IV. The early years of his reign were disturbed by a series of civil wars, but his mother, Queen Maria, succeeded in restoring order. After Ferdinand took the reins of government into his own hands, he proved himself entirely unfit to govern. The chief exploit of his reign, to which, however, Ferdinand contributed little, was the expedition against Algeciras in 1309, which resulted in the capture of Gibraltar. He died suddenly, Sept. 17, 1312. According to Mariana, he had condemned to death, unheard, two brothers of the name of Carvajal, and these, protesting their innocence, had summoned him to meet them within 30 days at the bar of God; hence the surname *el Emplazado*, "the Summoned." He was succeeded by his infant son, Alfonso XI. Consult Burke, *History of Spain*, vol. i (New York, 1904).

FERDINAND V, surnamed THE CATHOLIC (1452–1516). King of Spain; as King of Castile, Ferdinand V; as King of Aragon, Ferdinand II; as King of Naples, Ferdinand III. He was the son of John II, King of Aragon, and was born March 10, 1452. In 1469 he married, at Valladolid, Isabella, sister of Henry IV of Castile. On the death of Henry, in 1474, the Cortes proclaimed Isabella and her husband joint sovereigns of Castile and León. In 1479 Ferdinand became King of Aragon and Sicily, on the death of his father, and the two kingdoms of Aragon and Castile were united in the persons of Ferdinand and Isabella. Isabella, however, as long as she lived, maintained her position as Queen of Castile, and allowed her husband no other share in the government than the privilege of affixing his signature to the decrees and of uniting his arms with her own. Nevertheless, his influence in developing the Spanish monarchy was of capital importance. Ferdinand's reign was marked by uniform good fortune in his wars and his diplomacy. In Castile he distinguished himself by the effectual suppression of the banditti, who had become formidable in the confusion resulting from the civil wars. This he accomplished by reorganizing and putting in force against them the Hermandad, or Holy Brotherhood, a kind of national militia, representing all the cities of Spain. Not content, however, with taking strong measures against the Castilian outlaws, he also resolved to break the power of the feudal nobility and made good use of the Hermandad in carrying out this design. Cities and towns were encouraged to make themselves independent of the nobles, who were deprived of many important privileges. Among other humiliations they were subjected to the ordinary tribunals of justice. The reorganization of the Inquisition in 1478–80, although primarily and mainly intended to further religious ends, likewise helped to lessen their influence. Ferdinand also strengthened his power by vesting in himself and his successors the grandmastership of the military orders of Calatrava, Alcántara, and Santiago. In all his schemes he was ably seconded by his Queen, Isabella, and by the celebrated Cardinal Ximenes. The year 1492 was the most brilliant in his reign and is one of the most important in the history of the material progress of the world. It was signalized by the discovery of America by Christopher Columbus, though the honor of having aided the great navigator belongs, not to Ferdinand, but to Isabella. The beginning of the same year witnessed the entry of Ferdinand and Isabella into Granada and the end of Moorish dominion in Spain. This event was immediately followed by the expulsion of the Jews from the Spanish dominions and from Sicily. This act of barbarity entailed the loss of a large and industrious body in the community. Ferdinand was as successful abroad as at home. He was victorious over Alfonso V, King of Portugal, while his general, Gonsalvo de Cordova, decided the contest for the possession of the Kingdom of Naples between France and Aragon in favor of the Spaniards in 1503. In the following year Isabella died, but Ferdinand regained power after 1506 as Regent of Castile for his daughter, Joanna the Mad (who had married Philip, son of the Emperor Maximilian), and her son Charles. In 1505 Ferdinand married Germaine de Foix, a niece of Louis XII of France. He took part in the famous League of Cambrai, formed against Venice in 1508, made himself master of various towns and fortresses in Africa, and in 1512 conquered the main portion of the Kingdom of Navarre, thus becoming monarch of Spain from the Pyrenees to the Rock of Gibraltar. He died at Madrigalejo, Jan. 23, 1516, and was succeeded by his grandson, Charles I (afterward Holy Roman Emperor as Charles V). To Ferdinand and Isabella Spain owes her unity and greatness as a nation. Consult Prescott, *Ferdinand and Isabella* (Philadelphia, 1900).

FERDINAND VI (1713-59). King of Spain from 1746 to 1759, called "The Sage." He was the second son of Philip V and Maria Louisa of Savoy. On succeeding to power he withdrew from European complications by concluding the Peace of Aix-la-Chapelle (1748), and devoted himself to internal reforms in his kingdom, aided by his two able ministers, Carvajal and Ensenada, and by his Irish adviser, Wall. Financial, agricultural, and commercial reforms took place, and the arts were encouraged by the foundation of the Royal Academy of San Fernando and by state support for the higher education of Spanish students. In 1753, by a concordat with Pope Benedict XIV, the right of presentation to Spanish benefices was confined to the King for all save 50 offices. In the Seven Years' War Ferdinand refused to join the French and the English and remained neutral. In 1758 the King, who had never enjoyed good health, broke down almost completely after the death of his consort, Maria of Portugal, and lost his reason. Under these circumstances a regency was formed. He died at the monastery of Villaviciosa, Aug. 10, 1759. As he left no heirs, the crown passed by an act of settlement to his half brother, Charles III. Consult Coxe, *Memoirs of the Kings of Spain of the House of Bourbon* (3 vols., London, 1815), and Villa, *Marqués de la Ensenada* (Madrid, 1878). For a circumstantial account of his last sickness and death, consult Conde de Fernán-Núñez, *Vida de Carlos III, publicada con la biografía del autor, apéndices y notas por A. Morel-Fatio y A. Paz y Mélia, y un prólogo de D. Juan Valera* (2 vols., Madrid, 1898, in "Libros de Antaño," vols. xiv, xv).

FERDINAND VII (1784-1833). King of Spain, 1808 and 1814 to 1833. He was the son of King Charles IV and was born at San Ildefonso, Oct. 14, 1784. In 1789 he was proclaimed Prince of Asturias, and his education was intrusted to the Duke of San Carlos and the Canon Escoiquiz. Encouraged by them, he placed himself in opposition to the powerful Spanish Minister, Manuel de Godoy (q.v.), who, after the death of Ferdinand's first wife, Marie Antoinette Thérèse of Naples, in 1806, sought to marry the young Prince to Marie Thérèse de Bourbon. Upon this Ferdinand took the advice of the French Ambassador, Beauharnais, and wrote to Napoleon asking for the hand of one of the Emperor's nieces. Spanish spies, acting on behalf of Godoy and the Queen, unearthed this correspondence, and the Prince was arrested by order of Charles IV and confined in the Escorial in 1807. These events were followed by the French invasion of Spain, which so inflamed the people against Godoy and the King and Queen that they were forced to flee from Madrid. In March, 1808, following on the rising at Aranjuez, Charles IV abdicated in favor of Ferdinand, who was immediately proclaimed as Ferdinand VII amid great rejoicing. The French, under Murat, however, entered Madrid a few days later, and Charles IV, instigated by the French, withdrew his abdication, in a letter to Napoleon, on the ground that it had been extorted from him. The Emperor thereupon invited Ferdinand VII to a conference at Bayonne, and in spite of warnings the new King repaired thither, only to find himself a prisoner. The disorder in Madrid consequent on Murat's occupation was laid at Ferdinand's door, and after repeated negotiations and threats the Prince signed one paper renouncing the throne in favor of his father, and another by which he ceded to Napoleon all his rights of succession to the Spanish monarchy. In return he was to receive a pension of 800,000 francs and the château of Valençay. There he remained for the next six years, with his uncle, Don Antonio, and his brother, Don Carlos.

In 1813, after Wellington's victorious campaign in the Peninsula, Napoleon offered to reinstate Ferdinand on the Spanish throne. In March, 1814, the long-wished-for sovereign returned and was received with every demonstration of loyalty. All acts promulgated during his absence, including the constitution of 1812, were abrogated, and the old order of things restored. For six years Ferdinand sought to make himself absolute, and opposition was punished by banishment, imprisonment, and death; but insurrection succeeded insurrection, until in 1820 a serious mutiny took place among the Spanish troops, which was supported by the Cortes and the people, and Ferdinand was forced to confirm the constitution of 1812. But the struggle between the Constitutionalists and Royalists continued and finally ended in the triumph of the former (1822); thereupon the Holy Alliance sent a French army in 1823 to restore peace and absolutism, which, after an obstinate resistance on the part of the liberal element, succeeded. The Cortes, after the occupation of Madrid, retired to Cadiz, but were unable to hold the place against the invaders. Ferdinand returned in triumph to Madrid, and his first act was to annul all liberal measures passed since 1820 as having been forced upon him. The Absolutist and Clerical party became practically supreme. In 1829 Ferdinand married his fourth wife, Maria Christina of Naples, and in 1830 abolished by a Pragmatic Sanction the Salic law as regarded female succession to the Spanish throne. This deprived his brother, Don Carlos, of the succession, by making the Infanta Isabella (born 1830) eligible to the throne, and led to the formation of the Carlist party in Spain. Through the influence of Calomarde (q.v.) Ferdinand was induced to revoke the Pragmatic Sanction of 1830, but soon after recalled his action and reaffirmed the succession of Isabella. In 1833 Isabella was proclaimed Princess of Asturias and heiress to the throne. Three months later (Sept. 29, 1833) Ferdinand died at Madrid, leaving his Queen, Maria Christina, regent. His reign was a most disastrous one for Spain, which lost almost all its possessions in North and South America and passed through vicissitudes and misfortunes that drained it of its best citizens and from which it has never recovered. Historians have not yet discovered any redeeming features in his character or his reign and his motives were consistently base. Consult: Seignobos, *Political History of Europe since 1814*, trans. by Macvane (New York, 1900); also *España del siglo XIX*, by various authors (Madrid, 1886-87); Baumgarten, *Geschichte Spaniens von 1789* (Leipzig, 1865-71). The Count of Casa Valencia published a diary that was kept by Ferdinand VII during the years 1820-23. Consult also: *Historia de la vida y reinado de Fernando VII de España, con documentos justificativos, etc.* (3 vols., Madrid, 1842); C. Le Brun, *Vida de Fernando Septimo, rey de España* (Philadelphia, 1826); M. A. S. Hume, *Modern Spain* (2d ed., London, 1906). See SPAIN.

FERDINAND I (1423-94). King of Naples from 1458 to 1494. He was an illegitimate son of Alfonso V of Aragon. He succeeded his father on the throne of Naples in 1458, but found an enemy in Pope Calixtus III, who favored John of Anjou. The latter invaded the kingdom and defeated Ferdinand. Pius II, the successor of Calixtus, supported him, however, and, with the assistance of Scanderbeg, the famous Albanian chief, John was defeated with great loss in August, 1462. In 1480 the Turks captured Otranto and slaughtered most of the inhabitants, but in the next year they were driven out. In 1485 a number of nobles revolted. Ferdinand held out the promise of a general amnesty if they would make submission and then treacherously murdered them. He died just as Charles VIII of France was about to invade his dominions. Though tyrannical, cruel, and treacherous, Ferdinand fostered industry and commerce and invited many humanists to his court, establishing a printing press at Naples in 1474. Consult Delaborde, *L'Expédition de Charles VIII en Italie* (Paris, 1888), and Sismondi, *History of the Italian Republics* (new ed., London, 1906).

FERDINAND II (1469-96). King of Naples from 1495 to 1496. He was the grandson of Ferdinand I, and son of Alfonso II, who abdicated in his favor in 1495. The kingdom was invaded by Charles VIII of France, and Ferdinand fled. He was able, however, with the aid of Gonsalvo de Cordova, the general of Ferdinand V, to regain his kingdom before his death. Consult Delaborde, *L'Expédition de Charles VIII en Italie* (Paris, 1888).

FERDINAND III. King of Naples. See FERDINAND V OF CASTILE.

FERDINAND I (1345-83), called "The Handsome." King of Portugal from 1367 to 1383, son of Pedro I. His reign was spent in fighting to obtain Castile for himself, and later for John of Lancaster, to the great loss of Portugal. Ferdinand died in 1383, and in 1385 an illegitimate son of Pedro I, John, founder of the dynasty of Aviz, was proclaimed King. Consult Stephens, *Portugal* (New York, 1891).

FERDINAND I (1751-1825). King of the Two Sicilies from 1759 to 1825. He was the third son of Charles III of Spain and was born at Naples, Jan. 12, 1751. When Charles ascended the Spanish throne, in 1759, Ferdinand succeeded him in Naples and Sicily under a regency of which the progressive Minister Tanucci was the head. Many reforms were inaugurated, and in 1767 the Jesuits were expelled from the kingdom. In 1768, after attaining his majority, the young King married Carolina Maria, a daughter of Maria Theresa of Austria, who was given a voice in the royal council after the birth of an heir and soon undermined the influence of Tanucci, who was dismissed in 1777. An Englishman, Sir John Acton, succeeded him in favor and became virtually Prime Minister. The Queen was cruel and dissolute and very much under the influence of Acton. It was at her instigation that Ferdinand was led to join England and Austria against France in 1793. He was glad to make peace with the Directory, however, in 1796. In 1798 he joined the secret alliance of Russia, Austria, and England, and his army occupied Rome. Ferdinand was no warrior and sadly lacked personal courage, for as soon as the French appeared and attacked his forces he fled to Naples and, embarking in an English man-of-war, escaped to Palermo. Naples was entered by the French, who, aided by a party of the nobles and citizens, established the short-lived Parthenopean Republic. The lower classes, who had fiercely opposed the French, were hostile to the new régime, and this, combined with reverses in northern Italy, led the French army to withdraw. The Republic collapsed before Cardinal Ruffo's Calabrian forces, and Ferdinand was restored. A reign of terror was immediately inaugurated, and the Republicans suffered greatly, but could do nothing in the presence of an English fleet under Nelson and a Royalist army. Relief came in 1801, when Ferdinand was forced to sign a treaty with France which included, besides various concessions, a general amnesty to political offenders and a clause allowing French troops to occupy his dominions. In 1805, at the instigation of Queen Caroline, he joined the Third Coalition and permitted 13,000 Russian and English troops to disembark at Naples. Napoleon won the victory of Austerlitz, and a French army forced the King and Queen of Naples to take refuge in Sicily. Naples was handed over to Joseph Bonaparte and later to Murat (1808), and it was not until 1815 that Ferdinand was restored. He had ruled over Sicily, however, under the title of Ferdinand III, until 1812, when he resigned his authority to his son Francis, under pressure from England, after granting the Sicilians a liberal constitution. After his restoration Ferdinand united the kingdoms of Sicily and Naples and assumed the title by which he is generally known—Ferdinand I, King of the Two Sicilies. Although he granted the Neapolitans a constitution as a condition of his recall, he speedily abolished it when firmly established. By his declaration of May, 1815, he had proclaimed individual and civil freedom, security of property, access for all alike to all posts and judicial independence. At the same time he was negotiating a treaty with the Emperor of Austria for the maintenance of the evils of the old régime in Italy. His tyrannical policy brought on the revolution of 1820, and he was forced to relinquish his authority to his son, who was named Viceroy, and to swear to observe the liberties of the people. At the Congress of Laibach, in the following year, however, he succeeded in securing Austrian aid and entered Naples in triumph in 1821, with an Austrian force at his back. Aided by his unscrupulous Minister, Canosa, Ferdinand took a cruel vengeance on his subjects. The system of espionage and arrest was continued under Canosa's successor, Medici, becoming worse each day. Ferdinand died suddenly Jan. 4, 1825, and was succeeded by his son, Francis I. For a good account of Ferdinand's reign, consult: Colletta, *Storia del reame di Napoli dal 1734 al 1825* (Eng. trans., Edinburgh, 1858); Lanzilatti, *Memorie storiche di Ferdinando I* (Naples, 1827); Jeaffreson, *The Queen of Naples and Lord Nelson* (London, 1889); Probyn, *Italy, 1815–78* (ib., 1884); R. H. Johnston, *The Napoleonic Empire in Southern Italy* (2 vols., London and New York, 1904); G. Orloff, *Mémoires historiques, politiques et littéraires sur le Royaume de Naples* (5 vols., Paris, 1821); Pignatelli Strongoli, *Memorie intorno al Regno di Napoli dal 1805 al 1815* (Naples, 1820); A. Schipa, *Il Regno di Napoli sotto i Borboni* (ib., 1903).

FERDINAND II (1810–59). King of the Two Sicilies from 1830 to 1859, known as "King Bomba." He was the son of Francis I by his second wife, Isabella María of Spain, and was born Jan. 12, 1810. On succeeding his father, in 1830, he found the country in the most wretched condition. The beginning of his reign was marked by specious promises of reform in the economy and government of the country. But Ferdinand soon began to listen to Austrian counsels, which saw danger for the whole peninsula in liberal measures. From that time Naples became the scene of incessant conspiracy, revolution, bloodshed, and political prosecutions. The King was aided by his infamous Minister of Police, Delcarreto, and an elaborate system of espionage was established. The general discontent was greatly aggravated by this obnoxious policy. After insurrections had taken place in 1837, 1841, 1844, and 1847, Ferdinand was forced to yield to the storm of 1848 and granted a constitution to both parts of his dominions. After following the constitution so far as to call the chambers together, he quarreled with the deputies, and on March 13, 1849, dismissed them, impatient of any interference with his authority. An insurrection which had broken out in Sicily was put down by a ruthless bombardment of Messina, an incident which earned for the King the name of Bomba. After the subjugation of Sicily he hastened completely to set aside the new constitution, while all who had taken any part in the agitation for reform were subjected to cruel persecution. In 1851 there were 13,000 political prisoners confined at Naples. Both France and England made strong representations in 1856, but in vain. Several attempts to assassinate Ferdinand failed, but in 1858 he was forced by Great Britain to liberate the political prisoners. Ferdinand died May 22, 1859, after terrible suffering, and was succeeded by his eldest son, Francis II. Consult: Nisco, *Ferdinando II ed il suo regno* (Naples, 1884); Dawburn, *Naples and King Ferdinand* (London, 1858); Thayer, *The Dawn of Italian Independence* (Boston, 1893); Stillman, *The Union of Italy* (Cambridge, 1898); Colletta, *Raccolta di documenti che servono ad illustrare i tre ultimi periodi rivoluzionari di Napoli 1799–1820–1848* (Naples, 1863–66); Probyn, *Italy, 1815 to 1878* (London, 1884); C. Livaroni, *Storia Critica del Risorgimento Italiano* (9 vols., Turin, 1888–97); Johnston, *The Napoleonic Empire in Southern Italy* (2 vols., London and New York, 1904); King, *A History of Italian Unity* (2 vols., London, 1899).

FERDINAND I (1549–1609). Grand Duke of Tuscany, fourth son of the first Cosimo de' Medici. He became Cardinal at the age of 14, and after the death of his brother, in 1587, succeeded to the rule of the grand duchy, being suspected of murdering his predecessor and Bianca Capello (q.v.). In 1589 he renounced the cardinalate and married Christine of Lorraine (died 1636), granddaughter of Catharine de' Medici. He favored the extension of commerce and of public works, continued the construction of the harbor of Leghorn, cultivated excellent relations with the other states of Italy, and permitted the Jewish refugees from Spain to settle in his realm. His numerous successful financial enterprises made him the leading capitalist of Europe.

FERDINAND II (1610–70). Grand Duke of Tuscany. He was a son of Cosimo II, whom he succeeded in 1621, becoming of age in 1628. He fell under the Spanish and Austrian influence of his mother, Maria Madelina of Austria. In 1642–44 he formed an alliance with Venice, Parma, and Modena, against the Papal States, and conducted a disastrous war which imposed heavy obligations on the people.

FERDINAND III (1769–1824). Grand Duke of Tuscany and Archduke of Austria. He was the second son of the Emperor Leopold II and was born at Florence, May 6, 1769. In 1790 he succeeded his father in the government of Tuscany, when the latter became Emperor through the death of Joseph II. A lover of peaceful progress, he remained strictly neutral in the first coalition against France and was the first sovereign in Europe to recognize the French Republic, in 1792. In 1793, intimidated by the combined menaces of the Russian and British cabinets, the Grand Duke was constrained to relinquish his neutral policy and to become a passive member of the coalition against France. In 1795, on the French occupation of Piedmont, he speedily reassumed friendly relations with France. In 1797, in order to save his state from annexation to the Cisalpine Republic, he concluded a treaty with Bonaparte on the most unfavorable terms, undertaking to pay a war levy to France and to transfer to the Museum of Paris some of the chief masterpieces of the Florentine galleries. Owing to the continued intrigues of France in his state, Ferdinand was forced to seek an Austrian alliance, which furnished Bonaparte with a pretext for declaring war against Tuscany. In 1799 Ferdinand had to retire to Vienna, and in 1801, at the Peace of Lunéville, he was forced to renounce all claims on Tuscany, receiving the title of Elector and the Principality of Salzburg (1803), which after the Peace of Pressburg, in 1805, he exchanged for the Duchy of Wurzburg. He was one of the princes in the Confederation of the Rhine (q.v.) and in 1814 was reinstated in his Grand Duchy of Tuscany by the Peace of Paris. In coöperation with his Chief Minister, Fossombroni, he reformed the institutions of the grand duchy according to his policy of benevolent despotism. He tried to divert intellectual force from dangerous channels. The people in vain opposed the inefficient army and bureaucracy administered by the indolent Fossombroni. Ferdinand died June 7, 1824, leaving his state to his only son, Leopold II. Consult: Schopis de Salermo, *La domination française en Italie, 1800–1814* (Paris, 1861); Tivaroni, *L'Italia prima della rivoluzione francese, 1789–1815* (Turin, 1889); Thayer, *Dawn of Italian Independence* (Boston, 1893); Inghirami, *Storia della Toscana* (Fiesole, 1843); Reumont, *Storia della Toscana sotto la dinastia di Lorena-Absburgo* (Florence, 1877); Tivaroni, *Italia durante il dominio austriaco* (Milan, 1892–94).

FERDINAND IV (1835–1908). Grand Duke of Tuscany. He was born in Florence, a son of Leopold II and of Maria Antonia, daughter of Francis I, King of the Two Sicilies. After his father had renounced the throne (July 21, 1859), Ferdinand assumed the title of Grand Duke and on March 26, 1860, issued a protest against the incorporation of Tuscany with Sardinia. Most of the remainder of his life was spent in the Austrian castle of Salzburg.

FERDINAND (1577–1650). Duke of Bavaria and Elector of Cologne, son of William V, Duke of Bavaria. He was born at Arnsberg and was educated by the Jesuits at the University of Ingolstadt. After the death (1612) of his uncle Ernst, whose coadjutor he had become in 1595, he succeeded as Elector of Cologne and as Bishop of Liége, Münster, and Hildesheim, to which, in 1618, Paderborn was added. He was an enthusiastic disciple of the Jesuits and zealously strove to exterminate heresy. He carried on with some success the contest with the burghers of Liége.

FERDINAND (1721–92). Duke of Brunswick and Prussian field marshal, a son of Ferdinand Albert II (q.v.). He was born at Wolfenbüttel, one of a family of 14 children. After a journey through the Netherlands, France, Italy, and Austria, he entered the Prussian service in 1740 as colonel, served on the staff of Frederick the Great during the first Silesian War, and afterward remained the companion of the King. Subsequently appointed major general, he served as commander of the foot guards in the Silesian campaign of 1745, when he greatly distinguished himself at the battle of Hohenfriedberg. He was one of the most skillful commanders during the Seven Years' War, his most notable achievements being his victories over the French at Crefeld (1758) and Minden (1759). He was estranged from Frederick in 1766 and left the Prussian service. In the American Revolutionary War he was suggested for the post of commander of the British troops. Consult Von der Osten's edition of Ferdinand's *Tagebuch* (Hamburg, 1805), and the military biographies by Knesebeck (Hanover, 1857–58) and Westphalen (5 vols., Berlin, 1859–72).

FERDINAND (1816–85). Titular King of Portugal. He was born at Vienna, Oct. 29, 1816, the eldest son of Ferdinand, Duke of Saxe-Coburg-Gotha. In 1836 he married Dona Maria la Gloria, Queen of Portugal. He received the title of King Consort the next year, and after the death of the Queen, in 1853, he acted as regent till 1855, during the minority of his son Pedro V. In spite of his foreign extraction Ferdinand was very popular in Portugal. In 1869 he was offered the Spanish crown by an influential delegation, but he refused, chiefly because he had made a love marriage with the celebrated American vocalist, Eliza Hensler, whom he created Countess of Elba, and whom he was unwilling to forsake. The rest of his life was spent in retirement. He devoted himself to painting and engraving with considerable success. He died in Lisbon, Dec. 15, 1885. Of the three sons of his first marriage, two, Pedro and Louis, became kings of Portugal. Consult Geidraye, *Résumé de l'histoire du Portugal au XIXème siècle* (Paris, 1875), also *Memoirs of the Duke of Saldanha* (London, 1880).

FERDINAND, *Ger. pron.* fĕr'dē-nănt, VICTOR ALBERT MAINRAD (1865–1927). Prince of Rumania. He was born at Sigmaringen, Prussia, the second son of Prince Leopold of Hohenzollern, elder brother of King Charles I of Rumania. After his father and his elder brother had renounced their title to the crown (Nov. 22, 1888), he was declared heir presumptive. In 1889 he became Senator and on March 18, 1889, was formally invested with the title of Prince of Rumania and pronounced by the King and the Legislative Assembly the successor to the throne. On Jan. 10, 1893, he married Marie Alexandra Victoria, the eldest daughter of the Duke of Edinburgh. He succeeded to the throne Oct. 11, 1914, on the death of his uncle.

FERDINAND ALBERT II (1680–1735). Duke of Brunswick. He was a son of Ferdinand Albert I (1638–87), first Duke of Brunswick-Bevern. During the War of the Spanish Succession he fought with the Imperial army in Württemberg and Bavaria and in 1711 became lieutenant general. He fought in the Turkish wars in the army of Prince Eugène and distinguished himself at Temesvár and Belgrade. As field marshal of the Empire (1733), he conducted the army from Pilsen to the Rhine in 1734 and subsequently took part in the operations there. He became Duke of Brunswick-Wolfenbüttel March 1, 1735, the year of his death. He was a particular favorite with King Frederick William I of Prussia. His son Anton Ulrich was father of Ivan VI, Czar of Russia; and his eldest daughter married Frederick the Great.

FERDINAND AND ISABELLA, HISTORY OF THE REIGN OF. A work by William H. Prescott, published in 1837.

FERDINAND, COUNT FATHOM, THE ADVENTURES OF. The third of Smollett's novels (1753).

FERDINAND OF PORTUGAL (1402–43). A prince of Portugal called the "Holy Prince," the sixth son of King John I. He took part in the expedition against Tangiers, under the leadership of his brother Henry (1437). Upon its defeat Ferdinand was left as hostage in the hands of the Sultan of Fez for the city of Ceuta, which Henry had promised as ransom. King John and the Cortes refused to yield it, and Ferdinand dragged out a slavery of six years. His bones were brought back to Portugal and buried in Lisbon, at first in the convent of the Saviour and later in the convent of Batalha.

He was beatified in 1470, and the Bollandists have included his life in their great publication.

FERDINAND WILLIAM (1659–1701). Prince of Württemberg-Neustadt. He was educated in mathematics and military science and after serving in Denmark entered the Imperial army in 1683, and fought with distinction against the Turks and the French, being severely wounded at Neuhäusel in 1685. In 1690 he commanded the auxiliary Danish troops in William III's campaign against Ireland. In 1692 he led the same troops to Holland, where he distinguished himself in the conflicts with the French at Steenkerk and Neerwinden and became general of infantry. In 1698 he entered the service of King Augustus the Strong of Poland and defeated the Turks in the Ukraine, compelling them to cede to Poland a portion of Podolia. In 1700 he campaigned against Sweden in Holstein.

FERENTINO, fâ'rĕn-tē'nô. An episcopal city in the Province of Rome, Italy, 1450 feet above sea level, 50 miles southeast of Rome (Map: Italy, D 4). Enormous blocks of stone and a gateway on the west mark the course of the walls of the ancient Ferentinum, a town of the Hernici colonized by the Romans. The town markets wine and oil and has a seminary, a gymnasium, and a cathedral paved with ancient marbles and mosaics. Pop. (commune), 1901, 12,279; 1911, 12,928.

FERENTINUM. A city of the Hernici, in ancient Italy. See Ferentino.

FERENTINUM. A city of the Etruscans, in ancient Italy. See Ferento.

FERENTO, fâ-rĕn'tô. A ruined city in central Italy, 5 miles north of Viterbo. It is near the site of the ancient Ferentinum, originally an Etruscan city. Extensive Etruscan, Roman, and mediæval remains of walls, baths, and a huge theatre have been excavated.

FERGHANA, fĕr-gä'nȧ. A province (*oblast*) of Russian Turkestan, Central Asia, situated between East (or Chinese) Turkestan, the Pamir, Bokhara, and the remainder of Russian Turkestan (Map: Asia, J 4). Its area is approximately 55,000 square miles. With the exception of the central portion, which forms the valley of the upper Sir-Daria, the surface of Ferghana consists both of mountains and steppes. The Alai and Trans-Alai mountains traverse it in the south. The larger part of the country is barren and unfit for cultivation. The climate is hot and the rainfall insufficient. The chief rivers are the Sir-Daria and the Kizil-Su. Lake Kara Kul is situated in Ferghana. The agricultural land is found mostly along the Sir-Daria, where cereals and fruit are raised to some extent. The cultivated area is about 3,000,000 acres, most of which is under constant irrigation. The silkworm industry, for which Ferghana was specially known, is no longer prosperous. The region is rich in minerals, including coal, lead, graphite, and petroleum. The manufacturing industries of Ferghana are of considerable importance, although most of them are carried on as house industries. The leading manufactures are leather, silk, rugs, paper, knives, and saddles. Cotton, raisins, dried fruits, and tobacco are exported. Imports consist of textiles, silk stuffs, copper goods, tea, sugar, and dyes. The trade is chiefly with Russia, Bokhara, and East Turkestan. The value of imports and exports aggregates about $17,000,000 annually. The Transcaspian and Orenburg-Tashkent railways cross portions of its area and have materially stimulated its commerce with Samarkand, Bokhara, and Tashkent.

The population in 1911 was officially estimated at 2,069,000, of whom the larger part were Sarts, and the rest Kirghizes, Tajiks, Russians, Jews, etc. The capital is New Marghelan, with a population of about 12,000. Old Marghelan has a population of 46,400; Khokam, 112,000. Ferghana constituted a part of the Sogdiana of the Greeks. It was invaded by the Arabs during the eighth century and was under the rule of the Samanids for two centuries thereafter. Conquered successively by a number of Oriental rulers, including Timur, the country obtained its independence at the end of the eighteenth century, when it was known as the Khanate of Kokand, or Khokand, the territory of the khanate being then much larger than the present territory of Ferghana. Internal dissensions gave the Russians an opportunity for interference, and in 1876 the khanate was annexed to Russia under the name of Ferghana.

FER'GUS. A town of Wellington Co., Ontario, Canada, on Grand River, and at the junction of the Grand Trunk and Canadian Pacific railways, 13 miles northwest of Guelph (Map: Ontario, D 6). The manufactured products include farm accessories, lime, and building stone, and there are marble works and cereal and saw mills. Pop., 1901, 1396; 1911, 1534.

FER'GUS FALLS. A city and the county seat of Otter Tail Co., Minn., 177 miles northwest of Minneapolis, on the Great Northern and the Northern Pacific railroads and on the Red River (Map: Minnesota, A 4). It is in the "park" region of the State, the centre of a productive agricultural district, and has abundant water power. The manufactures include flour, woolen goods, cement tile, undertakers' supplies, foundry and machine-shop products, sash and doors, brooms, beer, etc. The city contains a Carnegie library, two general hospitals, a State hospital for the insane, and the Park Region Lutheran and Northwestern colleges. Fergus Falls, chartered as a city in 1883, is governed under the charter of that date, which provides for a mayor, annually elected, and a city council. It owns the water works and electric-light plant. Pop., 1900, 6072; 1910, 6887.

FER'GUSON, Adam (1723–1816). A Scottish philosopher and historian. He was born at Logierait, Perthshire, where his father was parish minister; studied at the universities of St. Andrews and Edinburgh, and in 1745 was appointed chaplain to the Forty-third (afterward Forty-second) Regiment, in which capacity he was present at the battle of Fontenoy and is said to have charged the enemy sword in hand, among the foremost of the regiment. In 1757 he abandoned the clerical profession and succeeded David Hume as keeper of the Advocates' Library in Edinburgh. The same year he took a great interest in the success of the tragedy of *Douglas*, written by his friend John Hume, and wrote in its defense *The Morality of Stage Plays* (1757), which brought him into considerable notice. He was appointed professor in Edinburgh University, first of natural philosophy, in 1759, and subsequently (1764) of moral philosophy. The next year he published his *Essay on the History of Civil Society*. He then devoted some time to collecting material for a Roman history, but his work was interrupted by travel on the Continent with the young Earl of Chesterfield in

1774–76, and in 1778 by his duties as secretary to the commission sent out by Lord North to try to arrange the disputes between the North American Colonies and England. In 1783 appeared his chief work, *The History of the Progress and Termination of the Roman Republic* (3 vols.). It is a carefully written narrative of the history of the Roman people during 500 years. In 1785 ill health forced Ferguson to give up his professorship, and in 1792 he published his academic lectures under the title of *Principles of Moral and Political Science*. His *Institutes of Moral Philosophy* (1772) has been used as a textbook in several foreign universities. Consult the biographical sketch by John Small (1864).

FERGUSON, Donald (1839–). A Canadian legislator and administrator. He was born at Marshfield, Prince Edward Island, was educated at the public schools, and early engaged in journalism in his native province. In 1878 he was elected a Conservative member of the Provincial Legislature, in which he retained a seat until 1891. Appointed (1878) Minister of Public Works, he subsequently became Provincial Secretary and Commissioner of Crown Lands, holding the two latter offices until his retirement from provincial politics. In 1893 he was appointed a Dominion senator. In the following year he became a minister without portfolio in the cabinet of Sir Mackenzie Bowell, and he held the same office in the succeeding cabinet of Sir Charles Tupper until the defeat of the Conservatives in 1896. He supported legislation to repress the liquor traffic.

FERGUSON, Elsie (Louise) (1883–). An American actress, born and educated in New York City. In 1907 she married Fred Hoey. She first played in *The Liberty Belles* in 1901 at Madison Square Garden, New York City, and subsequently appeared in *The Earl of Pawtucket* (1903), and in 1908 toured the United States in *Pierre of the Plains*, *The Battle*, and *The Traveling Salesman*. She starred in *Such a Little Queen* (1909), *Dolly Madison* (1911), *Primrose* (1912), *Rosedale* and *Arizona* (1913), and *The Unseen Empire* (1914).

FERGUSON, James (1710–76). A Scottish astronomer, born near Keith, in Banffshire. Of humble origin, he enjoyed only three months of instruction at school, and his subsequent acquirements were the result of his own ardent desire for knowledge. After being employed in keeping sheep and drawing, he supported himself and his parents by making portraits, first in Edinburgh, and afterward (1743) in London, his leisure time being devoted to astronomical pursuits. In 1748 he began to deliver popular lectures on astronomy and mechanics with considerable success, a feature of his lectures being the remarkable apparatus of his own construction, which he used for purposes of illustration. He was elected a fellow of the Royal Society in 1763 and received from George III a pension of £50. He now gave up portrait painting and devoted himself to lecturing and writing on his favorite scientific subjects. Few men in Europe did more to promote a knowledge of the results of science among those who did not have the advantage of regular scientific training. His principal works are: *Astronomy Explained upon Sir Isaac Newton's Principles* (1756; Sir David Brewster's ed., 2 vols., 1811); *Lectures on Mechanics, Hydrostatics, Pneumatics, and Optics* (1760), also edited by Sir David Brewster in 1805; *Select Mechanical Exercises, with an autobiography* (1773). Consult Henderson, *Life of James Ferguson, F.R.S.* (London, 1867).

FERGUSON, James (1797–1867). An American astronomer and civil engineer. He was born in Perthshire, Scotland, but in 1800 was brought by his father to New York. He was engaged, as assistant engineer, on the construction of the Erie Canal in 1817–19, was assistant surveyor in the boundary commission appointed in accordance with the Treaty of Ghent from 1819 to 1822, and was astronomical surveyor of this commission from 1822 to 1827. From 1833 to 1847 he was first assistant in the United States Coast Survey and from 1847 until his death was assistant astronomer of the United States Naval Observatory. He discovered several asteroids and was a frequent contributor to scientific and other magazines.

FERGUSON, John Calvin (1866–). An American in the service of the Chinese government. He was born in Ontario, Canada, and graduated from Boston University in 1886 (Ph.D., 1902). He was president of Nanking University from 1888 to 1897 and of Nanyang College (Shanghai) from 1897 to 1902. He served as adviser to the viceroys of Nanking (after 1898) and Wuchang (1900–10), and was secretary of the Chinese Ministry of Commerce (1902), the Imperial Chinese Railway Administration (1903–07), and the Ministry of Posts and Communications (after 1911). In addition, he was sent by the Chinese government on special missions to the United States in 1901, 1904, and 1907, was chairman of the Central China Famine Relief Committee in 1910–11, and proprietor of the Shanghai *Times* in 1907–11. He became a member of many foreign orders and societies and in 1911–12 was president of the North China branch of the Royal Asiatic Society, whose journal he had edited from 1902 to 1911.

FERGUSON, Louis Aloysius (1867–). An American electrical engineer, born at Dorchester, Mass. After graduating from the Massachusetts Institute of Technology in 1888 he was employed by the Chicago Edison Company as engineer of the underground department, but was soon promoted, becoming electrical engineer of the company in 1890, general superintendent in 1897, and second vice president in 1902. He also served as general superintendent (1898–1902) and as second vice president (1902–07) of the Commonwealth Electric Company, to which he devoted his entire attention after 1907. In 1895 he became a staff lecturer at the University of Wisconsin. Ferguson contributed substantially to efficient central-station practice. He was president of the National Electric Light Association in 1902–03 and of the American Institute of Electric Engineers in 1908–09.

FERGUSON, Margaret Clay (1863–). An American botanist, born at Phelps, N. Y. She graduated (1899) from Cornell University, where she received the degree of Ph.D. in 1901. Previously she had been a teacher and a principal of public schools (1886–88), had had charge of science work at the Harcourt Place Seminary (Gambier, Ohio) (1892–93), and had been instructor in botany at Wellesley College (1894–96). Returning to Wellesley she became associate professor in 1904, professor in 1906, and head of the department of botany in 1904. She was assistant in 1901 and 1902 and instructor in 1903 in the Cornell Summer School. The American Association for the Advancement of Science elected her a fellow. Her publications consist of papers on plant embryology and physiology and also *Contributions to the Knowledge of the Life History of Pinus with Special Reference to Sporogenesis, the Development of the Gametophytes and Fertilization* (1904).

FERGUSON, Patrick (1744–80). A British soldier, inventor of the first practical breech-loading rifle. He was born in Scotland and was educated at a military academy in London. Before he was 15 years old he was appointed cornet in the Royal North British Dragoons, or Scots Greys, and served with them in the German campaign. The skill of the American marksmen during the first year of the Revolutionary War prompted him to devise several new forms of breech-loading firearms. In the first the breech was closed by a vertical screw plug, which was lowered to admit the introduction of the ball, followed by the cartridge or charge; in the second, the breech was closed by a perpendicular or horizontal turnplate; and in the third a sliding transverse bar was used. His own demonstrations of his rifle were singularly successful. He was ordered to America, where, early in 1777, he formed a corps of riflemen, consisting of volunteers from British regiments, armed them with breech-loading rifled carbines with screw-plug action, sighted for 100 to 300 yards. The corps distinguished itself at the battle of Brandywine (Sept. 11, 1777), but was afterward disbanded by Sir William Howe because he had not been previously consulted as to its formation. Ferguson played a conspicuous part in the war in the Carolinas, but was defeated and killed at King's Mountain, S. C. (Oct. 7, 1780).

FERGUSON, Robert (?–1714). A British political writer and pamphleteer, known as the "Plotter." He was born at Badifurrow, Aberdeenshire, Scotland, was probably educated at the University of Aberdeen, entered the ministry, and held a living at Godmersham, Kent, from which in 1662 he was expelled by the Act of Uniformity. The Shaftesbury party in 1680 sought and secured his services as a writer of political pamphlets attacking the government. He wrote pamphlets of remarkable ingenuity, attempting to prove the marriage of the King to Lucy Walters, the Duke of Monmouth's mother, and opposing the Exclusion Bill. He was implicated in 1683 in the Rye House Plot, although he asserted that he entered it in order to frustrate it. He saved himself by fleeing to Holland. He accompanied Monmouth as his secretary and chief adviser to the west of England in 1684, and after the battle of Sedgmoor, in 1685, escaped again to Holland. He accompanied William of Orange to England in 1688 and wrote various pamphlets in his behalf, but not receiving the recognition he had hoped for and being removed (1692) from the Excise, he suddenly became an ardent Jacobite and was in most of the plots during William's reign. He was several times arrested and imprisoned, but never brought to trial. Besides his religious and political pamphlets, he wrote: *A History of the Revolution* (1706); *Qualifications Requisite in a Minister of State* (1710); *The History of All the Mobs, Tumults, and Insurrections in Great Britain* (1715). Consult James Ferguson, *Ferguson the Plotter* (Edinburgh, 1887).

FERGUSON, Sir Samuel (1810–86). An Irish poet and antiquarian, born at Belfast. He studied at Belfast and afterward went to Trinity College, Dublin, where he graduated in 1826. He practiced law for some time and was then made deputy keeper of the public records of Ireland (1867). For his services in this difficult position, which entailed much research, he was knighted in 1878. His poems and stories appeared constantly in the *Dublin University Magazine*, and he was also a contributor to *Blackwood's Magazine*. In 1882 he was elected president of the Royal Irish Academy. It is said that his imperfect knowledge of the Irish language interfered with an entirely faithful rendering by him of Gaelic myth and legend. Be this as it may, he holds an honored place among those who in English poetry have made the modern world acquainted with the strange beauty of the ancient Celtic imagination. His epic poem, *Congal*, in five books (1872), is probably his most important work; other volumes are *Lays of the Western Gael* (1865) and *Poems* (1880). *Tales from Blackwood* (1st series, vols. iii, vii, viii, and xii) contain several examples of his work. A collection of his stories and poems, including among the latter many early ones, was edited by Lady Ferguson and called *Hibernian Nights' Entertainments* (1887). He is now known to be the author of an extraordinary *jeu d'esprit* formerly attributed to William Maginn and entitled *Father Tom and the Pope* (1838), which admirably represents the Irish fancy in the full career of its wildest wit and drollery. He also wrote several antiquarian studies, of which the best known is *Ogham Inscriptions in Ireland, Wales, and Scotland*, ed. by Lady Ferguson (1887). Consult *Sir Samuel Ferguson in the Ireland of his Day* (2 vols., London, 1896), by his wife, Mary C. Ferguson.

FERGUSON, Samuel David (1842–1916). An American negro bishop of the Protestant Episcopal church. He was born at Charleston, S. C., and emigrated (1848) with his parents to Liberia, Africa, where he was educated in mission schools. He became a teacher in 1862, and was ordained deacon in 1865 and priest in 1868. In 1884 the House of Bishops elected him missionary Bishop of Cape Palmas, and he was consecrated in Grace Church, New York, in the following year. He received the honorary degrees of D.D. from Kenyon College in 1885 and D.C.L. from Liberia College in 1893. Ferguson was the first African to become a bishop of the Protestant Episcopal Church of America.

FER'GUSSON, James (1808–86). A Scottish architectural writer. He was born at Ayr and was educated at the high school in Edinburgh. He afterward entered the firm of Fairlie, Fergusson & Co., at Calcutta, India. Having made a fortune in the indigo trade, he retired from business and devoted himself to the study of archæological and architectural subjects. In 1857 he was appointed a member of the Royal Commission to inquire into the defenses of the United Kingdom. He received a gold medal from the Royal Institute of British Architects in 1871 and was a vice president of the Royal Asiatic Society at the time of his death. Though he never practiced architecture, his advice was often sought by those in charge of the construction of public buildings. Fergusson was the first to show that architecture from the Renaissance to the present day consisted mainly of revivals and imitations of ancient styles, whereas that of the preceding ages was in general spontaneously evolved. His writings include: *Illustrations in the Rock-Cut Temples of India* (1845); *The*

Illustrated Handbook of Architecture (1855); *A History of Architecture in All Countries from the Earliest Times to the Present Day* (1867–76; 3d ed., 5 vols., 1891–99), which because of its comprehensive scope and suggestive criticism still ranks among the best in the field; *History of Indian and Eastern Architecture* (1876; new ed., 2 vols., 1910). Consult the brief biography in the *Architect*, vol. xxxv (1886).

FERGUSSON, Robert (1750–74). A Scottish poet. He was born in Edinburgh and was educated at the Dundee grammar school and at the University of St. Andrews. Giving up the church, for which he was at first intended, and refusing to study medicine, he returned to Edinburgh, where he found employment as a copyist in the office of the commissary clerk. This position he held, for the most part, till his death. In 1771 he contributed poems to *Ruddiman's Weekly Magazine*, and they gained him great local reputation. His society was eagerly sought, and in that convivial time he was led into excesses which impaired his health. He became melancholy and, from the effects of a fall, insane. His *Poems* were published in 1773. In 1789 Burns placed over his grave a memorial bearing a verse epitaph. Fergusson, a fluent and natural versifier in the Scottish dialect, was the forerunner of Burns. Consult: *Works*, edited with *Life*, and *Essay on Poetical Genius* by Grosart (Edinburgh, 1851); Ward, *English Poets*, vol. iii (New York, 1889); G. B. S. Douglas, *Scottish Poetry: Drummond of Hawthornden to Fergusson* (ib., 1911).

FERGUSSON, Sir William (1808–77). A British surgeon. He was born at Prestonpans, Scotland, and was educated at Edinburgh. In 1831 he was elected surgeon of the Edinburgh Royal Dispensary, and after 1836 he served in the same capacity at the Royal Infirmary. He afterward successively became professor of surgery at King's College, London (1840–70), surgeon in ordinary to the Prince Consort (1849), and to the Queen (1867), president of the Royal College of Surgeons (1870), and clinical professor of surgery at King's College (1870–77). In 1866 he was created Baronet. He was for many years the leading operator in London and was the inventor of numerous ingenious surgical instruments, such as the "bulldog" forceps, vaginal speculum, and the mouth gag for cleft palate. He was especially successful with the operations for harelip and cleft palate and for the amputation of limbs. His principal works are *The Progress of Anatomy and Surgery in the Nineteenth Century* (1867) and a *System of Practical Surgery* (5th ed., 1870).

FE′RIÆ (Lat., holidays). Holidays in ancient Rome during which political and legal transactions were suspended and slaves enjoyed a cessation from labor. Feriæ were thus *dies nefasti*, the opposite of the *dies fasti*. (See Fasti.) Days which were consecrated to a particular divinity, on which any public ceremony was celebrated, and the like, were feriæ. In contradistinction to these, which were *feriæ publicæ* (public holidays), there were *feriæ privatæ*, which were observed by single families, in commemoration of some particular occurrence of importance to them or their ancestors. Birthdays, days of purification after a funeral, etc., were also observed as family feriæ. The public feriæ were divided into those which were always kept (*stativæ*) on certain days marked in the calendar, and those which were kept by command of the consuls or other superior magistrates on the occasion of any public emergency (*imperativæ*). There were 45 fixed holidays in ancient Rome and a large number of movable *feriæ*, the most important of which were the *feriæ latinæ*, the original common festival of the Latin tribes, held on the top of the Alban Mount, afterward carried to Rome along with the supremacy over Latium; the *feriæ sementivæ*, or sowers' festival, in the spring; and the *feriæ vindemiales*, or vintage festival, in the fall. Consult Fowler, *Roman Festivals* (London, 1899), and Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

FERISHTAH. See Firishtah.

FERLAND, fâr′läɴ′, Jean Baptiste Antoine (1805–64). A Canadian clergyman, historian, and biographer. He was born in Montreal and was educated at Nicolet College, where (after being ordained to the priesthood of the Roman Catholic church, serving as vicar of Quebec, and filling several pastorates in his native province) he was appointed a professor (1841) and superior (1848). In 1834 he served as hospital chaplain at Quebec during the cholera outbreak, and in 1847 he distinguished himself by his courage during an epidemic of typhoid fever. He was attached to the cathedral at Quebec and was made a member of the Bishop's council (1850); was appointed professor of Canadian and American history in Laval University (1855), and became dean of the faculty of arts (1864). Ferland's work as a historian was remarkable no less for its lucid and charming style than for the patience, thoroughness, and impartiality with which original sources were explored and the inaccuracies and misrepresentations of former Canadian historians and biographers were corrected. In this respect he ably carried on the work initiated by F. X. Garneau. He published: *Observations sur une histoire du Canada par l'Abbe Brasseur* (1853); *Notes sur les regitres de Notre Dame de Québec* (1854); *Cours d'histoire du Canada* (vol. i, 1861; vol. ii, by Laverdière, 1865); *Journal d'un voyage sur les côtes de la Gaspésie* (1861); *Lettre sur la mission du Labrador* (1862); *Notice biographique sur Monseigneur Joseph Octave Plessis, Evêque de Québec* (1863); *Louis Olivier Gamache* (1863).

FERLAND, Joseph Auge-Albert (1872–). A Canadian artist and poet. He was born in Montreal and after completing his early education studied art, history, literature, and theology. As an artist he produced a large number of historical portraits; but his poetical work is more important and has won distinguished recognition. He contributed frequently to *Les Soirées du Château de Ramesay*. He was also one of the founders of Ecole Littéraire of Montreal, an organization whose membership represents the new school of French-Canadian poetry. Ferland afterward became its president. In 1893 he was elected a corresponding member of the French Academy of Literature and Biography. He published *Mélodies poétiques* (1893), and *Femmes rêvées*, with preface by L. H. Frechette (1899). Consult Roy, "French-Canadian Literature," in *Canada and its Provinces*, vol. vi (22 vols., Toronto, 1913–14).

FERMANAGH, fĕr-măn′ȧ *or* fĕr-mä′nȧ (named from the Irish clan *Fir-Monach*, men of Monach). An inland county in the southwest of the Province of Ulster, Ireland (Map: Ireland, D 3). Area about 715 square miles. The most important town in the county is Enniskillen (q.v.). There are pottery works at Belleek. The population, chiefly engaged in agriculture, shows a gradual decline since 1841, when it was 156,481. In 1851 it was 116,047; 1891, 74,170; 1901, 65,430; 1911, 61,836.

FERMAT, fâr'mȧ', Pierre de (1601–65). A French mathematician, born at Beaumont-de-Lomagne, near Montauban. He was one of the most versatile mathematicians of his time and was unsurpassed as a contributor to the theory of numbers. Fermat was educated privately, was of a retiring disposition, and published little during his lifetime. At one time he turned his attention to law and in 1631 became counselor for the Parliament of Toulouse. The first edition of his works, gathered from his papers, annotations, and personal letters, was published in two volumes under the title *Opera Mathematica* (1670–79). Copies of this edition have become quite rare. The first volume contains the Arithmetic of Diophantus annotated, and the second, monographs on maxima and minima tangents, and centres of gravity, and copies of his correspondence with Huygens, Pascal, Descartes, and others. His chief contributions to the theory of numbers are found in his commentaries on Diophantus. Among them are such well-known propositions as follow: If a is prime to p, p being a prime number, then $a^{p-1}-1$ is divisible by p, or, expressed in the notation of congruences (q.v.), $a^{p-1}-1 \equiv 0$ (mod. p). A prime greater than 2 can be uniquely expressed as the difference of two squares. The expression p^2+q^2, where p is prime to q, is not divisible by a prime of the form $4n-1$. If p, q, r, are integers such that $p^2+q^2=r^2$, then pq cannot be a square. The equation $x^2+2=y^3$ has a unique solution, and the equation $x^2+4=y^3$ has two solutions. The equation $x^n+y^n=z^n$ has no integral root if n is integral and greater than 2. This proposition has never been proved, and a large prize is at the disposal of the University of Göttingen for the first proof that the mathematical world will accept as valid. In the case of particular curves Fermat obtained the maximum and minimum values of their functions; also the subtangents of the ellipse, cycloid, conchoid, and quadratrix. The methods employed so resembled those afterward developed through the differential calculus that some mathematicians, especially Laplace and Lagrange, have suggested Fermat as the inventor of the calculus. The rise of the theory of probability (see Probability) may be dated practically from the correspondence of Fermat and Pascal (1654). Fermat's answers to the problems suggested by Pascal reveal his firm grasp on the fundamental principles of probabilities. For further information concerning the life and work of Fermat, consult: Libri, *Journal des savants*, pp. 539–561 (1839); Brassinne, *Précis des œuvres mathématiques de Fermat* (Paris, 1853); Hoefer, in the *Nouvelle Biographie Universelle*, xvii, 438–451; Henry, "Recherches sur les manuscrits de Pierre de Fermat," in the *Boncompagni Bulletin*, vols. xii and xiii; Paul Tannery, "Sur la date des principales découvertes de Fermat," in the *Bulletin Darboux*, 2d series, vol. vii (1883); "Les manuscrits de Fermat," in the *Annales de la Faculté des lettres de Bordeaux*. The *Œuvres* of Fermat were republished by Tannery and Henry under the auspices of the Minister of Public Instruction (Paris, 1891–94).

FERMATA, fĕr-mä'tȧ (It., stopped). In music, the name given to a pause or resting point, generally marked by the sign 𝄐. The notes over which this sign is placed are prolonged beyond their true length.

FER'MENTA'TION (from Lat. *fermentare*, to ferment, from *fermentum*, yeast, from *fervere*, to boil). Fermentation as applied to certain lower forms of plants is the counterpart of respiration in the higher plants and various lower forms. The two processes are alike in that both are dissimilative; both are exothermic and release energy that is of physiological use in the organism, and so far as the mechanics of the processes have been worked out, both are carried on by the action of organic catalyzers, or enzymes (q.v.). Fermentation is generally distinguished from respiration by the facts that the oxidations or decompositions are less complete, involving, of course, a less copious release of energy, and that the particular organisms are more limited in the substances available for decomposition. These destructions hold only in part, for while in respiration (q.v.) the carbon compounds are commonly oxidized to CO_2 and H_2O, sometimes the oxidations stop with organic acids or even ethyl alcohol as end products; many succulents in darkness oxidize the sugar mainly to malic, isomalic, or oxalic acid; *Aspergillus glaber* oxidizes a large part of the sugar to oxalic acid so long as the substratum is neutral or only slightly acid; and many flowering plants under limited oxygen supply produce organic acids as end products, while in total absence of oxygen they carry on alcoholic fermentation. On the other hand, many organisms that are considered as carrying on fermentations may dissimilate a great variety of materials, or even under proper conditions carry on "normal" respiration. This is especially true of yeasts. The marked similarity and lack of definite points of distinction between fermentation and respiration have led some authors to treat both processes under respiration.

Besides furnishing energy to the organism, fermentations apparently often have significance in producing materials in the substratum that kill competing organisms of other species. *Aspergillus* does this by excreting oxalic acid, yeast by producing ethyl alcohol, and Citromyces by forming citric acid. In the first case the organism ceases the excretion before the acid reaches a concentration injurious to itself. In the other two there is said to be no such regulatory formation, at least in cultural conditions.

Fermentations are often named from the principal products, e.g., alcoholic, lactic, butyric, acetic, etc. On the other hand, there are cases where they are named from the substance fermented, as is the case with cellulose fermentation. The greatest variety of substances are fermented: proteins, cellulose, pectins, sugars, alcohols, acids, paraffins, and a variety of inorganic materials such as ammonia, hydrogen sulphide, hydrogen, and carbon monoxide. In fact, any reduced substance that results from various physiological processes seems to be available to one organism or another as a source of energy through oxidation or splitting. The end products of one fermentation or another are no less numerous: alcohols, acids, methane, hydrogen, hydrogen sulphide, carbon monoxide, amino acids, ammonia, etc. Some of the most active fermentations are produced by the simpler organisms, the bacteria (q.v.) and the lower forms of fungi (q.v.), especially the yeasts and mucors.

The fermenting power of these organisms is so conspicuous that they were formerly called "organized ferments" to distinguish them from enzymes. But in these forms, as in higher plants, the processes are probably carried on by enzymes. Some of the ferment organisms are adapted to live wholly without oxygen for respiration, securing the necessary energy by fermenting the medium in which they live; such, e.g., are the butyric ferments (*Bacillus amylobacter*). Others are able to utilize free oxygen during periods of sluggish fermentation or to do without it temporarily or for a considerable period by setting up active fermentation; such are the yeasts.

Fermentations may be grouped as (1) splitting; (2) oxidative; (3) compound.

(1) Splitting fermentations are most common; they consist in the separation of the fermentable substance into two or more products. The best known of these is the alcoholic fermentation of sugar, produced chiefly by yeasts (*Saccharomyces*) and mucors. In this process, which is employed commercially on a large scale in the manufacture of beer, wine, and spirits, and in the making of bread, most of the sugar (95 per cent) is split up into alcohol and carbon dioxide thus: $C_6H_{12}O_6 = 2C_2H_5OH + 2CO_2$. The other 5 per cent is used as building material, normally respired or fermented otherwise. It has been recently shown that this action is due to zymase, an enzyme formed by the yeast, in which several others had previously been found. Only sugars, the number of carbon atoms in whose molecules is 3 or a multiple of 3, can be fermented in this way. Of the hexoses d glucose, d mannose, d galactose, and d fructose are fermentable. Cane sugar, a disaccharide, is first broken up by invertase into glucose and fructose, which are then fermented. Different yeasts attack the sugars differently; some ferment maltose and not saccharose; some ferment fructose better than glucose, others act on it less readily. Alcoholic fermentation is stopped by the accumulation of alcohol in the fluid beyond 10–19 per cent in the different yeasts. Lactic-acid fermentation is well known from causing the "souring" of milk and fruit juices. Lactic-acid bacteria (especially the *Bacterium acidi-lactici*) are the agents. They attack the glucose directly, and the saccharose and lactose after "inversion," converting the former into glucose and fructose and the latter into glucose and galactose. About 83 per cent of the sugar is converted into lactic acid; the rest is transformed into various by-products. The presence of 8 per cent, or even less, of free acid stops the fermentation. Butyric fermentation is responsible for the aroma of butter. The products (among which are butyric acid) are numerous and diverse; the process is complex and varied in its details. The fermentation of cellulose is of great cosmic significance in avoiding the too great accumulation of carbon in a form unusable by most organisms. One cellulose fermenting organism produces acetic and butyric acid in abundance, other organic acids in traces, also carbon monoxide and hydrogen. A second sort produces similar products with methane instead of hydrogen. Both these forms are anærobic. Other organisms also take part in this important process. Pectic materials, another important constituent of cell walls, is also fermented by various organisms.

(2) Oxidative fermentations cause the formation of new compounds by oxidation of the old. The most important case is presented by the transformation of ordinary alcohol into vinegar. In making malt vinegar dilute alcohol is allowed to trickle slowly over beech shavings slimy with the acetic organisms *Bacterium aceti*. By the time the liquid reaches the bottom of the cask, the alcohol has become converted into acetic acid. The oxidation takes place according to the following chemical equation:

$$CH_3CH_2OH + O_2 = CH_3COOH + H_2O.$$

Some of the acetic-acid organisms can attack a great variety of substances. In absence of alcohol the acetic acid may be oxidized to carbon dioxide and water. The various fatty acids are oxidized to their corresponding alcohols. Sugar, mannit, and other substances can be normally respired. It is probably correct to place in this group the nitrite and nitrate organisms of the soil which oxidize ammonia first to nitrites and then to nitrates, and the sulphur bacteria which oxidize hydrogen sulphide of putrid streams to sulphuric acid. The action of these organisms is of great importance in the nitrogen and sulphur cycles.

(3) Compound fermentations are combinations of splitting and oxidative fermentations. They include mainly putrefactions, the chemical changes of which are little known. The products are numerous and often ill-smelling. See ENZYMES; DIGESTION, ORGANS OF; RESPIRATION, ORGANS OF; VINEGAR; ALCOHOL; BEER; BREWING; DISTILLED LIQUORS.

FERMENTED AND DISTILLED LIQUORS. See DISTILLED LIQUORS; LIQUORS, FERMENTED AND DISTILLED.

FERMO, fĕr′mô. A city in the Province of Ascoli Piceno, Italy, 1020 feet above sea level, 4 miles from the Adriatic, of which it has a splendid view, and 37 miles south of Ancona (Map: Italy, D 3). Its small harbor is known as Porto san Georgio. It is the seat of an archbishop, and its cathedral rests on the foundations of a famous temple of Juno; at the main gate are the ruins of the immense ancient wall; and in the city hall, part of which dates from the fourteenth century, are Roman antiquities and inscriptions. Fermo has a lyceum, a gymnasium, an industrial and a convict school, a theatre, and a public library, is lighted by electricity, and ships large quantities of grain, silk, and wool. Breeding silkworms is an important industry. Its name comes from that of the ancient Firmum Picenum, whose ruins are in the vicinity. Pop. (commune), 1901, 20,542; 1911, 22,570.

FER′MOR, ARABELLA. The daughter of James Fermor of Tusmore, the theft of whose curl by Lord Petre inspired Pope's "Rape of the Lock." She died in 1738.

FERMOR, fâr′môr, WILLIAM, COUNT (1704–71). A Russian soldier, born at Pskov, in the government of that name. He was commissioned lieutenant general in 1746 and in 1758 was placed in command of the Russian army in the war against Frederick the Great, when he took Königsberg and all of eastern Prussia. On August 25 of that year, however, he was defeated by Frederick at Zorndorf, and in 1759 he relinquished the command to General Soltikov. Subsequently, under Catharine II, he was for a time Governor of Smolensk.

FERMOY, fĕr-moi′. A town in the east of County Cork, Ireland, on both banks of the Blackwater, 19 miles northeast of Cork (Map: Ireland, C 7). The hills to the south of the town reach an altitude of 1388 feet in Knockinskeagh. Fermoy is an important garrison town with barrack accommodation for 3000 troops. It is the seat of an extensive Roman Catholic establishment, comprising a cathedral, episcopal palace, two convents, and a college (St. Colman's). Agricultural products and grist mills constitute the principal industries. Fermoy dates from the foundation of a Cistercian abbey in the twelfth century; its modern importance is due to the enterprise of Sir John Anderson, who built the barracks, platted the town, and established a mail-coach service throughout Munster at the beginning of the nineteenth century. Pop., 1901, 10,518; 1911, 11,226.

FERN (AS. *fearn*, OHG. *farn*, Ger. *Farn;* probably connected with Skt. *parna*, feather, leaf, and with Russ. *paporotĭ*, Ir. *raith*, fern). A plant of the order Filicales, one of the great living groups of Pteridophytes. The group contains about 4000 of the 4500 species belonging to the Pteridophytes and therefore is usually considered to be the representative group. Although known in considerable numbers in the temperate regions, its chief display is in the tropics, where ferns form a striking and characteristic feature of the vegetation. In habit ferns vary from those with delicate and filmy mosslike leaves to treelike forms, rising to a height of 35 to 45 feet and crowned by a rosette of leaves 15 to 20 feet long. The various species of ferns are prevailingly terrestrial plants, but some of them are aquatic, even floating; while there are numerous forms, especially in the tropics, which are epiphytic, i.e., they perch upon other plants. The Filicales differ from the other groups of Pteridophytes chiefly in having a few large leaves which do both foliage work and spore bearing. The alternation of generations (q.v.) is very distinct, the sexual plant (gametophyte) being represented by the prothallium, and the sexless plant (sporophyte) by the leafy plant. The prothallium is like a small liverwort, with a dorsiventral body, and numerous rhizoids extending from its undersurface. It is so thin that all of the cells contain chlorophyll, and it is usually short-lived. The antheridia (male organs) and archegonia (female organs) are usually developed on the undersurface of the prothallium and differ from those of the mosses in that they are sunken in the tissue of the prothallium and open on the surface, more or less of the neck of the archegonium projecting. The eggs are not different from those formed within the archegonia of mosses, but the sperms are very different. The fern sperm is a long spirally coiled body, blunt behind, and tapering to a long beak in front, which bears numerous retrorse cilia.

The sexless, leafy plant consists in the main of a subterranean dorsiventral stem, which gives out secondary roots from beneath and sends up characteristic aërial leaves which have long been called "fronds." The leaves are recognized not merely by their ordinary habit of branching, but better by their venation, which is forking or dichotomous (q.v.), and by their vernation, which is coiled or circinate. The spore vessels (sporangia) are borne for the most part on the undersurface of the foliage leaves, usually closely associated with the veins, and organized into groups of definite form known as "sori." The sorus may be round or elongated and is usually covered by a delicate flap known as the "indusium" (q.v.), which arises from the epidermis. Occasionally the sori are extended along the undersurface of the margins of the leaf, as in the maidenhair fern and common brake, in which case they are protected by the inrolled margin. While in most cases the leaves doing foliage work also produce sporangia, there are some forms in which the two kinds of work are separated, certain leaves doing only foliage work and others producing spores, the latter being called sporophylls, as in the ostrich fern (*Struthiopteris*), the climbing fern (*Lygodium*), the royal fern (*Osmunda*), etc. An ordinary fern sporangium (spore vessel) consists of a slender stalk bearing a spore case. This case has a delicate wall formed of a single layer of cells, and extending vertically almost around it from the stalk, like a meridian about a globe, is a row of peculiar cells with thick walls, forming the heavy ring called the "annulus." The annulus is like a bent spring, and when the delicate portion of the case wall yields the spring straightens violently, the case wall is torn, and in the rebound the spores are discharged with considerable force.

The true ferns are often divided into two great groups on the basis of the origin of their sporangia. In one case the sporangium is purely an external structure, being derived from a single epidermal cell, and such ferns are said to be "leptosporangiate." In other ferns the sporangium involves the deeper structures as well and is really an internally developed organ; such ferns are "eusporangiate." The eusporangiate ferns are the more primitive forms and probably were the prevailing kind during the Carboniferous period. The living families are Marattiaceæ ("ringless ferns") and Ophioglossaceæ ("adder's-tongues" and moonworts"). The leptosporangiate ferns are the modern and abundant forms. There are two great divisions of Filicales, viz., the "true ferns" (Filicineæ) and the "water ferns" (Hydropteridineæ). Among the Filicineæ six great families are ordinarily recognized, as follows: Osmundaceæ, containing the royal ferns; Gleicheniaceæ, which are tropical forms; Schizæaceæ, which include the climbing ferns as well as various other peculiar genera; Hymenophyllaceæ, which contain the ferns with the most delicate bodies, often called the "filmy ferns"; Cyatheaceæ, which include among other forms the tree ferns; and, finally, Polypodiaceæ, the greatest and most highly organized family, to which almost all of the true ferns of the temperate region belong.

The water ferns (Hydropteridineæ) contain but few forms and grow either in water or marshy places. They are of particular interest from the morphological standpoint, because they are heterosporous (q.v.). There are two distinct families. Marsiliaceæ, represented by the common *Marsilia*, contains semiaquatic species with slender stems, which send down numerous roots into a mucky soil and give rise to comparatively large leaves, each of which has a long erect petiole and a blade of four wedge-shaped leaflets like a four-leaved clover. From near the base of the petiole another leaf branch arises in which the blade is modified as a spore-bearing structure, which incloses the spore cases and becomes hard and nutlike. The other family is the Salviniaceæ represented by *Salvinia*, whose species are floating forms.

Fossil Ferns. Our knowledge of Paleozoic ferns has become transformed during the last 10 years. Formerly it was thought that ferns were the dominant vascular group of the Carboniferous, constituting at least half of the vascular flora. It has now been discovered that many of these supposed ferns are the leaves of the most primitive gymnosperm group (see GYMNOSPERMS), which had foliage resembling the fronds of ferns so closely that the two groups cannot be distinguished by their leaves. Since there is no assurance that fernlike remains are ferns, it is difficult to determine the fern flora of the Paleozoic. There are numerous frond genera, sporangium genera, and stem genera which suggest ferns, but many of them doubtless belong to the fernlike gymnosperms. In general, two assemblages of undoubted ferns are recognized as existing during the Paleozoic. The most ancient assemblage is known as the Primofilices, a name of convenience to include a plexus of herbaceous forms having stems of simple structure, and also many characters suggesting the origin of the modern families. The only well-defined group of Primofilices, all of whose important structures are known, is called Botryopterideæ, whose principal genera are *Zygopteris* and *Botryopteris*. The other assemblage of Paleozoic ferns does not occur below the Coal Measures, and is called for convenience the Palæo-Marattiaceæ. These were arborescent forms with stems of complex structure, and the best-known genus is *Psaronius*, which was evidently a conspicuous tree fern of the later Paleozoic. During the Mesozoic nearly all of the modern fern families began to appear, so that the fern flora is recognized easily.

Consult: Hooker and Baker, *Synopsis Filicum* (London, 1874); Eaton, *The Ferns of North America* (Boston, 1880); Solms-Laubach, *Fossil Botany* (Oxford, 1891); Campbell, *Mosses and Ferns* (2d ed., London, 1905); Scott, *Studies in Fossil Botany* (ib., 1909); Coulter, Barnes, and Cowles, *Text-Book of Botany* (New York, 1910); Campbell, *The Eusporangiatæ* (Washington, 1911). See Plate of PTERIDOPHYTES.

FERN, FANNY. The pseudonym of Mrs. Sara Payson Willis Parton.

FERN, MALE. A popular name given to the fern *Aspidium filix-mas*. The male fern has a stout, more or less erect, chaffy, perennial rootstock, from which arise numerous annual, bright-green fronds, forming tufts 1 to 4 feet high. The stipe and midrib of the fronds are beset with brownish chaffy scales. The frond is oblong lanceolate, acute at apex and narrow below; the pinnæ are lanceolate, somewhat scattered towards the base of the stalk, and often confluent above; the fruiting bodies, or sori, are borne near the midrib of the ultimate segments of the fronds. Male fern is a native of Europe, Asia, northern Africa, and North America, where it is found in rocky woods from Labrador to Alaska and southward into the United States. It is also found in the Andes of South America. The part of the plant which is of commercial importance is the rootstock, which should be gathered between August and October, when its active constituents are most abundant. It is slightly tonic and astringent, but its chief use is as an anthelmintic, especially against tapeworms, for which it is considered a specific. This property of the male fern has long been known and is mentioned in the writings of Dioscorides, Theophrastus, Galen, Pliny, and others. The principal constituents of the rootstock are a greenish oil, the color being due to chlorophyll, a volatile oil, resin, and filicic acid, the latter being considered the active principle.

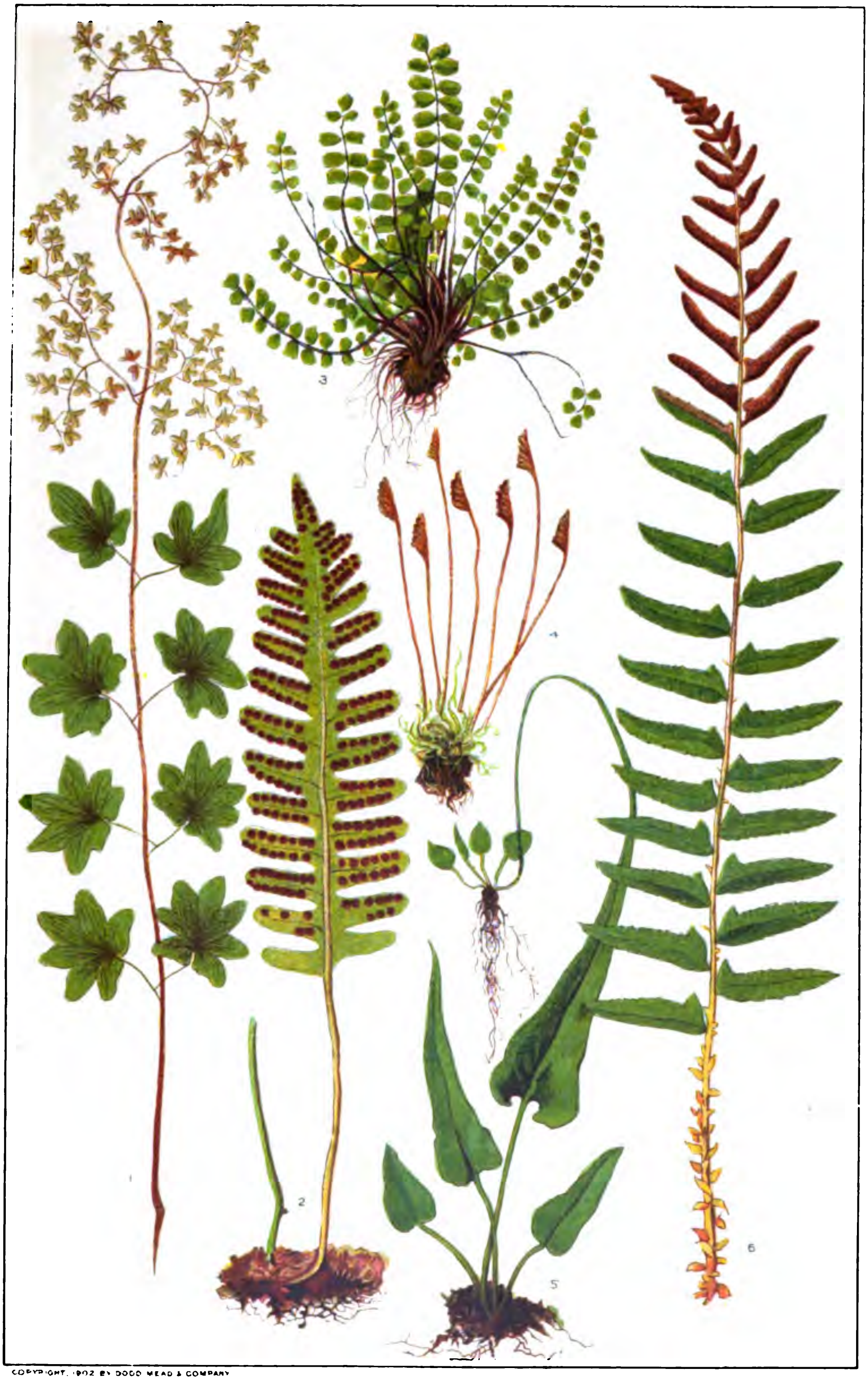
FERN, SWEET. See SWEET FERN.

FERNALD, fẽr'nald, CHARLES HENRY (1838-1921). An American zoölogist, born at Mount Desert, Me., and educated at Maine Wesleyan Seminary. During the Civil War he served as an ensign in the United States navy. He was principal of Litchfield Academy in 1865 and of Houlton Academy in 1866-71. After serving as professor at the Maine State College for 15 years he was professor and director of the Graduate School at Massachusetts Agricultural College from 1886 to 1910. He also became entomologist to the State Board of Agriculture. Besides scientific periodical articles, he is author of *Tortricidæ of North America* (1882); *The Butterflies of Maine* (1884); *Sphingidæ of New England* (1886); *The Crambidæ of North America* (1896); *The Pterophoridæ of North America* (1898); *The Brown-Tail Moth* (1903); *The Genera of the Tortricidæ and their Types* (1908).

FERNALD, CHESTER BAILEY (1869-). An American playwright and author of stories. He was born in Boston, but in 1889 settled in California, where he was assistant draftsman in the United States navy for four years. In 1893-94 he was Washington correspondent of the San Francisco *Chronicle*. He traveled extensively in the United States, Alaska, China, Japan, and European countries, especially in England, where he became a resident in 1907. His plays include: *The Cat and the Cherub; The Moonlight Blossom; The Ghetto; The Married Woman* (1913). He is also author of *The Original Papers* (1892); *The Cat and the Cherub and Other Stories* (1896); *Chinatown Stories* (1899); *Under the Jackstaff* (1903); *John Kendry's Idea* (1907).

FERNÁNDEZ, *Sp. pron.* fĕr-nän'dāth, JUAN (1536-c.1602). A Spanish navigator. For 40 years Fernández was the leading pilot on the southern Pacific coast. He made numerous voyages between the Spanish headquarters at Panama and the Peruvian and Chilean settlements. It is reported that he also made a voyage westward and visited the unknown lands of New Zealand or Australia, but this is extremely improbable. As the prevailing southern winds and shore currents made the voyage down the coast extremely slow, he was accustomed to sail well out to sea, with the result that he made the voyage in one-third the time taken by the vessels which hugged the shore from cape to cape. His rivals declaring that he was aided by the powers of evil, he acquired the nickname of the "Wizard," and was tried by the Inquisition for sorcery. On one of these voyages, probably in 1562, he hit upon the desert island which has since borne his name. He took possession of it, made a settlement there of 60 Indians, and tried to establish a fishing station. He soon failed and returned to the mainland, leaving on the island a few goats, whose descendants have been its principal inhabitants ever since. A friend took pity on the old and poverty-stricken sailor and gave him a plot of land at Quillota, in the Chilean mountains, where he settled down, after marrying, about 1590 or 1592. He left one son, from whom descended a large family of sailors. Consult Benjamín Vicuña-Mackenna, *Juan Fernandez: historia verdadera de la isla de Robinsón Crusoe* (Santiago de Chile, 1883), and A. Dalrymple, *An Historical Collection of the Several Voyages and Discoveries in the South Pacific Ocean* (London, 1769-71).

FERNS



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1 CLIMBING OR HARTFORD FERN - LYGODIUM PALMATUM
2 COMMON POLYPODY - POLYPODIUM VULGARE
3 MAIDEN-HAIR SPLEENWORT - ASPLENIUM TRICHOMANES
4 CURLY GRASS - SCHIZÆA PUSILLA
5 WALKING-FERN - CAMPTOSORUS RHIZOPHYLLUS
6 CHRISTMAS-FERN - ASPIDIUM ACROSTICHOIDES

FERNÁNDEZ DE CASTRO, fĕr-nän′dĕth dȧ kä′strō, Manuel (1825–95). A Spanish geologist. He was born in Madrid and, after graduating at the School of Mines there, traveled in various countries to study their railroad systems. The system of railroad signals suggested by him in his *La electricidad y los caminos de hierro* (1857) has been generally adopted. He was engaged in government mining and geological work from 1859 to 1869, when he became professor at the Madrid School of Mines. He was appointed director of the commission on the geological map of Spain in 1873.

FERNÁNDEZ DE CÓRDOBA, kôr′dō-bȧ, Diego, Marquis of Guadalcázar and Count of Posadas (fl. end of sixteenth and first half of seventeenth century). A Spanish administrator, Viceroy of Mexico and Peru. He was born, probably, at Córdoba and was a descendant of Gonzalo de Córdoba, "the Great Captain." He was Viceroy of Mexico from Oct. 18, 1612, until March 14, 1621. In 1616 he suppressed a serious revolt of the Tepehuan tribe of Indians, who had murdered several Jesuit missionaries living among them. While in Mexico he founded the cities of Lerma (1613), Córdoba (1618), and Guadalcázar (1620), and during his viceroyalty the aqueduct from Chapultepec to Mexico by way of San Cosme was completed. Transferred to Peru, Fernández governed that province as Viceroy, from July, 1622, to January, 1629, during which time he repelled the corsairs who ravaged the coast. In 1623 the Dutch under Jacob the Hermit, with a squadron equipped with 1700 men and 300 cannon, blockaded Callao for six months and attempted to take Lima. During his administration of the province Peru prospered and enjoyed a considerable degree of internal peace and quiet. Fernández returned to Spain in 1629.

FERNÁNDEZ DE CÓRDOBA, Francisco (c.1475–1526). A Spanish soldier and explorer. He accompanied Pedrarias to Castilla del Oro, Panama, in 1514 and in 1524 was sent by that commander to take possession of Nicaragua, ignoring the rights of the discoverer, Gil González Dávila. After exploring the country and founding several important settlements, he endeavored to sever his allegiance to Pedrarias and to establish a government of his own. On learning of the treachery of his lieutenant, Pedrarias conducted an army into Nicaragua and after defeating Córdoba ordered his execution.

FERNÁNDEZ DE CÓRDOBA Y VALCÁRCEL, Fernando (1809–83). A Spanish commander and statesman, who began military service in the royal guard shortly before the death of Ferdinand VII. His first field service was under his brother Luis, the hero of Mendigorría. In 1841 he was implicated with Concha in the conspiracy against Espartero; in 1847 he was Minister of War, and afterward was inspector general of infantry, and captain general of Catalonia. He was captain general of Cuba in 1850. In 1853 he was made general in chief of cavalry. He attempted to support Isabella in the outbreak of 1854, but when the revolution became successful he fled to France. He returned a few years later, and in 1864 Narváez made him Minister of War. In 1868 he took part in the Prim revolution against Isabella. In 1870 he was again appointed captain general of Cuba, and in 1871 he was made Minister of State *ad interim* at Madrid by King Amadeus. On the proclamation of the Republic he was named Minister of War. He published a simple and interesting account of his first military experiences in "Mis memorias íntimas" (first in the *Ilustración Española y Americana* and later in an edition de luxe).

FERNÁNDEZ DE ENCISO, ĕn-thē′sō, Martín (c.1470–c.1528). A Spanish lawyer and geographer. He went to America in 1500, set up as a lawyer in the island of Santo Domingo, and by 1509 had accumulated a fortune, which in that year he invested in the enterprise of Ojeda for the colonization of Tierra Firme. Ojeda having sailed in 1509, he followed in 1510. He found that Ojeda, beset by hostile Indians and failing of ammunition and supplies, had already returned in search of him. With the survivors of Ojeda's colony he founded Darien. He was shortly after deposed by Balboa, went to Spain, and in 1514 accompanied as alguacil mayor the expedition of Pedrarias, the newly appointed Governor of Darien. He published *Suma de geografía* (1519), the first account in Spanish of the discoveries in the New World, and in general more accurate than other early works of the sort.

FERNÁNDEZ DE LA CUEVA, lȧ kwā′vȧ, Francisco, Duke of Albuquerque (c.1610–?). A Spanish administrator. He was Viceroy of Mexico from 1653 to 1660 and as such is said to have encouraged science and art and built up the city of Mexico, but to have been excessively fond of display. The great cathedral of Mexico was completed and dedicated during his administration. In September, 1660, he was appointed Viceroy of Sicily.

FERNÁNDEZ DE LA CUEVA HENRÍQUEZ, ān-rē′kāth, Francisco, Duke of Albuquerque. A Spanish administrator of the eighteenth century, a grandson of Francisco Fernández de la Cueva. He was Viceroy of Mexico from Nov. 27, 1702, to Jan. 15, 1711. His term as Viceroy, like that of his grandfather, was marked by no great event, but was remarkable rather for the vast sums of money he squandered in order to maintain his splendid court, which far surpassed that of his predecessors and rivaled in pomp the most brilliant courts of Europe. It must be acknowledged, however, that he was a really able ruler, and well fitted to represent his sovereign in handling the delicate affairs that arose during the war of the Spanish Succession. The town of Albuquerque, N. M., founded at this time, was named in his honor.

FERNÁNDEZ DE PALENCIA, dȧ pä-län′thyä, Diego (c.1520–81). A Spanish soldier and author. He was born at Palencia, Spain, and in 1545 went to Peru, where he served in the Civil War of 1553–54. Appointed historiographer by the Viceroy Hurtado de Mendoza in 1556, he wrote his celebrated work *Primera y segunda parte de la historia del Perú* (Seville, 1571), which was an account of the Spaniards in Peru from 1544 to 1564. It is generally considered an authoritative work and is the best contemporary account of the conquest of Peru, although some critics have accused the author of partiality. For a notice of the book, consult W. H. Prescott's *History of the Conquest of Peru* (new ed., London, 1902).

FERNÁNDEZ MADRID, mȧ-drēd′, José (1789–1829). A South American physician, statesman, and poet. He was born at Cartagena, New Granada (Colombia), and was educated at

Bogotá. He took an active part in the revolt against Spanish rule and, upon the success of the movement, became in 1810 Procurator General. He was a representative in the Convention at Cartagena and upon the establishment of the Republic of New Granada was chosen deputy for Cartagena to its first general Congress. On March 14, 1816, he became President of New Granada, but was captured by the Spaniards and sent to Havana, Cuba, where for nine years he practiced as a physician and also achieved considerable distinction as an agronomist and author. Upon his return to New Granada in 1825, he was appointed by Simon Bolívar Minister to England. In June, 1820, he founded *El Argos*, a scientific, literary, and political periodical. His other works include two tragedies, *Atala* (1822) and *Guatimozín* (1827), a valuable treatise on yellow fever, a book of poems, and various papers on medical, agricultural, and scientific subjects. His fugitive poems and the volume entitled *Las Rosas* are considered his best works. The second and complete edition of his poems was published in London shortly before his death.

FERNANDINA, fĕr'nȧn-dē'nȧ. An early name of Cuba, given in honor of Ferdinand of Castile.

FERNANDINA, fĕr'năn-dē'nȧ. A city, port of entry, and the county seat of Nassau Co., Fla., on Amelia Island, 37 miles by rail north-northeast of Jacksonville on the Seaboard Air Line Railroad (Map: Florida, E 1). It has a good harbor on Amelia River which separates the island from the mainland. The city's export trade in 1912 amounted to $6,529,000, the principal articles of shipment being bluefish, phosphates, turpentine, lumber, naval stores, cotton, etc. Fernandina is also a popular winter resort and contains a public library, county courthouse, and a Catholic convent. Among points of interest in the vicinity are Amelia Beach, reached by a fine shell road, and Cumberland Island. The latter was the home of Gen. Nathanael Greene and is the burial-place of "Light Horse Harry" Lee. Settled by Spaniards in 1632, Fernandina was laid out in 1856 and incorporated in 1859. The present government is administered under a charter, last revised in 1899, which provides for a mayor, elected biennially, and a city council. The water works and electric-light and ice plants are owned and operated by the municipality. Pop., 1900, 3245; 1910, 3482.

FERNANDO DE NORONHA, fĕr-nän'dō dȧ nō-rō'nyȧ. A lonely island in the South Atlantic, situated in lat. 3° 50′ S. and long. 32° 25′ W., about 200 miles east-northeast of Cape St. Roque, on the coast of Brazil, to which it belongs (Map: South America, F 3). It is about 8 miles in length. The surface is rugged, rising in places to an altitude of about 1000 feet. The island, of volcanic origin, is well wooded, and the soil is productive, but lack of sufficient rainfall prevents the growth of luxuriant vegetation. It serves as a penal settlement for the State of Pernambuco. Pop., 2000, mostly convicts, who cultivate corn, cotton, manioc and other fruits.

FERNANDO PO, *Sp. pron.* fĕr-nän'dō pō'. A volcanic island in the Bight of Biafra, in lat. 3° 12′ N. and long. 8° 45′ E., about 20 miles off the west coast of Africa (Map: Africa, E 4). It is about 44 miles in length and 20 miles in breadth, with a total area of about 770 square miles. It has a very mountainous surface, rising to an altitude of over 9300 feet at the highest point. Forests of mahogany, oak, and ebony cover the slopes, and dense thickets of cotton, sugar cane, and indigo furnish shelter for the varied African tropical fauna. The soil is fertile and well watered, but the climate is excessively hot and unhealthful, the temperature varying but little throughout the year, the average for the coolest month being 74° F. and for the warmest 82° F. The chief products are bananas, rice, yams, corn, palm oil, cocoa, coffee, sugar, tobacco, and vanilla. The trade is insignificant. Pop., 1900, 20,741; 1910 about 25,000 (mostly Bubis and Portos). The island takes its name from the Portuguese navigator Fernando, or Fernão do Po, who discovered it in the latter part of the fifteenth century. Previous to the Spanish-American War it was used as a keep for Cuban political prisoners; since then Spain, deprived of her East and West Indian possessions, has begun much development work. In 1778 it was occupied by Spain. In 1827 the English, with the consent of Spain, founded the colony of Clarencetown. Being abandoned by the English in 1844, the island was again taken over by Spain a few years later. Chief town, Port Clarence (Santa Isabel).

FERNEY, or **FERNEY-VOLTAIRE,** fâr'nā' vōl'târ'. A town in the Department of Ain, France, 5 miles northwest of Geneva (Map: France, S., L 2). It is noted as the residence, from 1758 to 1778, of Voltaire. A bronze statue of the philosopher stands in the courtyard of the town hall. The château which he built has been converted into a museum of his personal relics and is visited annually by a large number of tourists. Pop. (commune), 1901, 1269; 1911, 1172.

FERNEY, The Patriarch of. Voltaire, so called from his place of retirement near Geneva.

FERNIE. A town in Kootenay District, British Columbia, Canada, situated near the Elk River, and on the Crow's Nest branch of the Canadian Pacific, the Great Northern, and the Morrissey, Fernie, and Michel railways (Map: British Columbia, F 5), about 300 miles east (direct) of Vancouver and about 700 miles by railway. It has fine public buildings, including the customhouse, post office, public and high schools, courthouse, skating and curling rinks, and two hospitals. It is the customs port of entry, judicial centre, and provincial police headquarters for East Kootenay; also the outfitting point for hunters in the East Kootenay game preserve. Big game is abundant in the vicinity. The manufacturing establishments include saw mills, railway-car shops, a foundry, breweries, brick works, and machine shops. The Crow's Nest Pass Coal Company employs 2000 men, with an annual output of 1,500,000 tons. The town supplies electric light and power. Near by is a 200-acre natural park with race track. Fernie is the seat of a United States consulate. Pop., 1911, 3146; 1914 (local est.), with tributary population, 7000.

FERN ISLES. See Farne Isles.

FERNKORN, fĕrn'kōrn, Anton Dominik (1813-78). A German sculptor, born at Erfurt, in the Province of Saxony, Prussia. He was a pupil of Stiglmayer and Von Schwanthaler at Munich and in 1840 established himself at Vienna, where he executed his first important work, the heroic equestrian statue "St. George and the Dragon" (courtyard of the Montenuovo Palace). In 1858 he completed for the cathedral of Speyer six of the eight freestone statues of the German emperors there buried. He was appointed director of the Imperial bronze foundry at Vienna and in that capacity did some of his best work (including the colossal equestrian statues of the Archduke Karl and of Prince Eugène, 1860 and 1864, in the Burgplatz, Vienna). Other important works are the monuments to Jellacic in Agram and Joseph Ressel in Vienna. He was skillful in his designs, which are bold and striking, but he lacked nobility of conception and frequently inclined rather to the graphic than the truly plastic.

FER′NOW, Bernhard Eduard (1851–1923). An American forester. He was born at Inowraclaw, Posen, Prussia, and was educated at the Academy of Forestry at Münden and at the University of Königsberg. He came to the United States in 1876 and thereafter was chief of the Division of Forestry in the United States Department of Agriculture (1886–98), director and dean of the New York State College of Forestry, Cornell University (1893–1907), professor of forestry in the State College of Pennsylvania for a year, and after 1907 dean of the faculty of forestry in the University of Toronto. For some time he was editor of the *Forester*. His publications include: *The White Pine* (1899); *Report upon Forestry Investigations of the United States Department of Agriculture, 1877–98* (1899); *Economics of Forestry* (1902); *History of Forestry* (1907); *The Care of Trees* (1911). The annual reports and bulletins of the Division of Forestry of the United States Department of Agriculture were edited by him from 1886 to 1898.

FERN OWL. See Nightjar.

FER OL′IGISTE (Fr., from *fer*, Lat. *ferrum*, iron + *oligiste*, from Gk. ὀλίγιστος, *oligistos*, least, from ὀλίγος, *oligos*, small; so called as containing less iron than its related magnetic oxide). A term sometimes applied to those steel-gray varieties of *hematite* that have a metallic lustre, especially the ores from Elba, Russia, and Sweden, which are also called *specular iron ore*.

FERO′NIA. An ancient Italian goddess, worshiped in Latium and central Italy, especially at Terracina (Horace, *Satires*, 1, 5, 24), and by Mount Soracte; at the latter place there was a famous *lucus Feroniæ*, and a great fair was held there on the feast days of the goddess (Livy, i, 30). Her worship was ultimately introduced into Rome, and a temple was built to her in the Campus Martius; her worship, however, never attained great prominence at Rome. Her temple at Terracina was specially devoted to the manumission of slaves. Consult Fowler, *Roman Festivals* (London, 1899), and Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

FEROZEPORE, fē′rôz-pôr′, or **FIROZPUR,** fē′rôz-pōōr′ (Hind., City of Firuz, so called from its founder, Firoz Shah III, who reigned in Delhi from 1351 to 1388). The capital of a district of the same name in the Punjab, British India, 3 miles from the southeast bank of the Sutlej (Map: India, B 2). At one time a large and important town, as its massive fortifications and extensive ruins indicate, it had sunk until its population was only about 2500 when it came into the possession of the English in 1835. Traders were induced to settle in the town, a large cotton press was erected, and the place has regained much of its former importance. It has wide streets and colonnaded bazars, and fine residences on the outskirts. It has a large grain market. The city contains a monumental church in memory of soldiers who fell in conflicts with the Sikhs, and it is the seat of the largest arsenal in India, and an important cantonment. Pop., 1901, 50,437; 1911, 49,341.

FER′RACUTE, or **FER′RAGUS** (It. *Ferran*). A personage appearing in many mediæval romances and in particular in *Valentine and Orson*. He is a giant of either Spanish, Portuguese, or Saracen extraction, of great strength, and invulnerable until he meets Orlando. In his castle is a great head of brass, which answers all his questions.

FERRAND, fȧ′rän′, Joseph (1827–1903). A French jurist. He was born at Limoges and from 1871 to 1874 was prefect successively of Haute Savoie, Aisne, and Calvados. In 1888 he was appointed corresponding member of the Academy of Moral and Political Sciences. His principal works are: *De la propriété communale en France et de sa mise en valeur* (1859); *Les institutions administratives en France et à l'Etranger* (1879); *La réforme municipale en France et en Italie* (1881); *Les pays libres, leur organisation et leur éducation d'après la législation comparée* (1884); *L'Organisation municipale de Paris* (1887).

FERRAND, Marie Louis (1753–1808). A French soldier, born at Besançon. He saw his first active service under Count Rochambeau in America and was at Yorktown. He fought in the first campaigns of the French revolutionary wars and became a brigadier general. His friendship for Lafayette led to his imprisonment during the Terror. In 1801, as second in command, he accompanied General Leclerc's expedition to Santo Domingo. Ferrand was placed in command of the troops in the eastern part of the island and was successful in his campaign; but the army under Leclerc, in the western part of the island, after being almost wiped out of existence by yellow fever, had surrendered to the insurgents, and Ferrand, with only 1800 troops, confronted 25,000 men under Dessalines, the rebel leader. He held out bravely for two years, until reinforced by Admiral Missiessy in 1805. As Governor-General, he kept the island in comparative peace for several years. Later in 1808 there was a general uprising, with which Ferrand, deserted by the Spanish colonists, was unable to cope. He was attacked and defeated by a superior force under Ramirez, a creole leader, and killed himself on the battlefield.

FER′RAR, Nicholas (1592–1637). An English theologian. He was born in London, the son of a wealthy merchant, and was educated at Cambridge. From 1618 to 1623, after extensive travels on the Continent, he gave up all his time to the Virginia Company. On the revocation of its charter in 1623, Ferrar turned his attention to political life and in 1624 was elected to Parliament. Afterward he bought a neglected manor house and estate at Little Gidding, in Huntingdonshire, where he was joined by the families of his brother and brother-in-law. He was ordained a deacon and became the religious head of the community, although he never took priest's orders. With the increasing hostility to everything partaking of Catholicism, and the growth of Puritanism, Little Gidding was made the object of bitter attacks, a pamphlet published concerning it in 1641 being entitled *The Arminian Nunnery*. At Little Gidding Ferrar lived quietly, devoting himself to theological studies and preparing a harmony of the Gospels, of the Mosaic Law, and a history of the Israelites. These works were printed and bound by members of the community. Consult Peckard, *Life of Mr. Nicholas Ferrar* (Cambridge, 1790), of which there have been reprints and revisions; also *The Story Book of Little Gidding* (1899), a volume of his religious dialogues.

FERRARA, fĕr-rä'rȧ. A city of Emilia, northern Italy, capital of the Province of Ferrara and an archiepiscopal see, about 4 miles south of the main channel of the Po and 30 miles north-northeast of Bologna (Map: Italy, C 2). It is situated in fertile, marshy, unhealthful territory, the threshold of the city hall being 3 feet lower than the level of the Po. The broad streets, the ancient walls, towers, and bastions, and the crumbling palaces attest the mediæval glory of Ferrara, when it was the seat of the house of Este (q.v.). It is reputed to have had, in the sixteenth century, 100,000 inhabitants. In the ancient square castle, in the centre of the town, now occupied by the local authorities and the telegraph office, are frescoes by Dosso Dossi (?1474–1542), and dungeons, in one of which the faithless Parisina Malatesta (consult Byron's poem "Parisina") was confined by her husband before being beheaded, May 21, 1425. The cathedral of San Giorgio has a striking façade, dating from the eleventh, twelfth, and thirteenth centuries, but the interior was modernized by Mazzarelli in 1712. Artists whose work is represented here are Baroncelli, Lombardi, Tura, Bastianino, Garofalo, Panetti, Giacomo da Siena. The campanile is massive and handsome. Other interesting churches are San Francesco, dating from 1494, with frescoes by Garofalo and monuments of the house of Este; Santa Maria in Vado, which was altered in 1495 in the early Renaissance style and has frescoes by Bonone; San Benedetto, built 1496–1553, with paintings by Scarsellino; and San Cristoforo.

Other interesting buildings are the episcopal seminary, formerly the Palazzo Trotti, with frescoes by Garofalo; the Palazzo Schifanoja, begun by Alberto d'Este in 1391, completed by Borso in 1469, with celebrated fifteenth-century frescoes, now an asylum for deaf mutes; the incomplete Palazzo Costabili, with frescoes by Ercole Grandi; the sixteenth-century Palazzo de' Diamanti, containing the municipal picture gallery, most of the works in which belong to the school of Ferrara, at the head of which ranks Dosso Dossi; the Hospital of Santa Anna, where Tasso was confined (1579–86); the tiny house of Ariosto, now the property of the city, bearing a Latin couplet composed by himself; the house of the poet Guarini, which still belongs to his family. In the Piazza Ariostea is a statue of Ariosto (1833) by Vidoni, and between the castle and the cathedral is a monument by Galetti to Savonarola (q.v.), born here in 1452.

The university, which is not a state institution, was founded in 1264 and, after various vicissitudes, reopened in 1815. It has botanical gardens, a physical laboratory, faculties in medicine, mathematics and natural science, and jurisprudence, a rich collection of ancient coins and inscriptions, and a library with 100,000 volumes, over 2000 manuscripts (among them several from the hand of Ariosto himself), 3200 autographs, and numerous etchings, etc. The monument of Ariosto is in the library. Ferrara also has a theological seminary, a gymnasium, etc., an Ariosto Society, four theatres, numerous charitable institutions, a chamber of commerce, a telephone system, and public gardens. The city markets wheat, rice, hemp, wine, silk, cattle, salt, and fruit, and has silk, hemp, and soap factories and flour mills.

The origin of the city is very uncertain. We hear of it first about the middle of the eighth century as belonging to Ravenna. Then it passed into the hands of the Count of Modena and finally won its independence from the latter. At the end of the tenth century the popes, basing their authority on grants from Pepin and Charlemagne, bestowed it as a fief on the margraves of Tuscany. In 1208, after a period of independence, it came under the rule of the Este (q.v.), who persuaded Paul II, in 1471, to raise it to a duchy. In 1598, on the extinction of the main branch of the house of Este, Ferrara was united by force to the Papal States by Clement VIII. In 1797 it was united to the Cisalpine Republic and afterward to Napoleon's kingdom of Italy. It was restored to the Pope in 1814 and in 1859 became part of the dominions of Victor Emmanuel. The population of Ferrara is about 35,000; in 1901, the population of the commune was 87,648, and, in 1911, 95,219. Consult: Frizzi, *Memorie per la storia di Ferrara* (5 vols., Ferrara, 1857 et seq.); Noyes, *Story of Ferrara* (London, 1904); Agnelli, *Ferrara e Pomposa* (Bergamo, 1902); Gardner, *Dukes and Poets of Ferrara* (London, 1904).

FERRARA, Francesco (1810–1900). An Italian political economist and statesman, born at Palermo. In 1834 he was appointed director of the Bureau of Statistics for Sicily. He was professor of political economy successively at Turin and at Pisa and in 1864 became director of the Bureau of Rates and Taxes. He entered the Chamber of Deputies in 1865, was Minister of Finance under Ratazzi (from May to July, 1867), and in the following year was appointed director of the Royal School of Commerce at Venice. In 1881 he became Senator. He wrote a work on *Importanza dell' economia politica* (1849) and edited the first two series of the *Biblioteca dell' economista* (27 vols., 1850–68). His statistical writings appeared in a volume of the *Annali di Statistica* (Rome, 1890).

FERRARA-FLORENCE, Council of. The Council of Basel, convened in 1431 by Pope Martin V, having fallen into a series of disputes with Martin's successor, Eugenius IV, the latter in 1437 issued a bull transferring the sessions to Ferrara. He was obeyed only by Cardinal Julian, the president, and four bishops; the council itself continued in session at Basel. (See Basel, Council of.) To the five delegates, however, who met at Ferrara, Jan. 5, 1438, others fresh from their homes were added, so that at the second session 72 bishops were present, over whom the Pope presided. The Emperor of Constantinople, John Palæologus, was also present and brought with him patriarchs, bishops, and other ecclesiastics, amounting in all to 700 persons. His object in coming was to effect the reunion of the Greek and Latin churches in the hope that he could thus secure the aid of the West against the Turks, who were then pressing hard upon the Empire. The Pope also desired this union as a personal triumph over his adversaries in the Council of Basel, and he hoped that he would be accepted as a leader of the crusade against the Turks. The points of difference between the Greek and Latin churches were

(1) upon the doctrinal point whether the Holy Spirit proceeded, as the Greeks maintained, only from the Father, or, as the Latins held, from the Son also (see FILIOQUE); (2) whether the bread used in the Lord's Supper should be leavened, as the Greeks held, or unleavened, as the Latins did; (3) whether the Pope should be accepted as the head of Christendom, overriding the authority of the Greek patriarchs; (4) whether the Greek doctrine of a middle state after death without the remedial pain of fire, or the Roman doctrine of purgatory in which punishment by fire as an expiatory penalty and satisfaction for repented sin, was to be maintained. These and some minor points were discussed. In January, 1439, in consequence of the outbreak of the plague in Ferrara, the sessions of the council were continued in Florence, and there an agreement between the representatives was arrived at; viz., the supremacy of the Pope was acknowledged, the Spirit said to proceed from the Father through the Son, and the Latin views in general prevailed. But the union celebrated on July 6, 1439, was short-lived. The council was continued by the Latins in Rome till 1445, and temporary union made with other Oriental churches. Consult: Hefele, *History of the Councils* (Eng. trans., Edinburgh, 1871); Gorski, *History of the Council of Florence* (Eng. trans., London, 1861); Creighton, *History of the Papacy*, vol. ii (London, 1882).

FER′RARESE′ SCHOOL OF PAINTING. One of the chief schools of northern Italy, usually grouped with the early school of Bologna as the school of Ferrara-Bologna. It owed its origin, in the middle of the fourteenth century, to followers of Squarcione (q.v.) of Padua and was also influenced by the work of the Florentine Piero della Francesca (q.v.) at Ferrara. From the former it derived its archæological and naturalistic tendencies, from the latter its knowledge of perspective. It was also characterized by good drawing, modeling, and careful execution, but was deficient in color. The school of Ferrara grew up under the patronage of the house of Este. Its chief representatives were Cosimo, Tura, Lorenzo Costa, Dosso Dossi, and Garofalo (qq.v.). The Bolognese school originated about 1470, when a number of Ferrarese artists, chief among whom was Lorenzo Costa, went to Bologna. Francesco Francia, the head of the school, learned painting from Costa; he and Timoteo Viti (q.v.) were its chief masters. Consult: Baruffaldi, *Vite de' pittori Ferraresi* (Ferrara, 1844); Laderchi, *Pittura Ferrarese* (ib., 1856): Crowe and Cavalcaselle, *History of Painting in North Italy*, ed. Borenius (London, 1912); Morelli, *Italian Painters*, vol. ii (ib., 1900); Berenson, *North Italian Painters of the Renaissance* (New York, 1907).

FERRARI, fĕr-rä′rê, BENEDETTO (1597–1681). An Italian poet and composer, sometimes called Della Tiorba. He was born at Reggio and was educated at Rome. The opera *Andromeda*, for which he wrote the text, and which was set to music by Manelli da Tivoli and performed at Ferrari's expense at the Teatro San Cassiano at Venice (1637), was the first opera to be produced publicly, all previous compositions of this kind having been performed privately.

FERRARI, ETTORE (1849–). An Italian sculptor. He was born in Rome and studied at the Accademia di San Luca, in which he was later appointed a professor. He came to be recognized as one of the most eminent Roman sculptors of his day. His work is accurate and sensitive in modeling, minute and naturalistic in detail, and forceful and truthful in expression, but is often marred by excessive emotionalism. Among his best-known productions are a statue of Ovid in Rumania; the widely admired figure of Giordano Bruno in the Campo di Fiore, Rome; the equestrian statue of Victor Emmanuel on the Riva at Venice; the majestic ideal figure of Ancient Latium for the frieze of the National Monument to Victor Emmanuel, Rome; the graceful bronze lyre on Shelley's grave in Rome. He became vice president of the Superior Council of Fine Arts and a commander of the Crown of Italy.

FERRARI, GAUDENZIO (c.1484–1546). A Lombard painter of the Renaissance. He was born at Valduggia in Piedmont. Little is known of his life, which was passed mostly at Vercelli, Varallo, and Milan, where he took up his residence in 1536 and died on Jan. 31, 1546. It was formerly supposed that his first teacher was Girolamo Giovenone at Vercelli; but this view was overthrown by Morelli. He is now thought to have studied under Scotto at Milan, and he was certainly influenced by Bramantino and Luini. Whatever he adopted from these masters he thoroughly assimilated, adding to it an energetic naturalism of his own. In his earlier period he painted in the manner of the Lombard school, but towards the end of his life he adopted the exaggerated forms then in vogue, and his works show the growing influence of Correggio. They always display intense dramatic action, although the composition is often overcrowded. In his frescoes the color is bright, sometimes even gaudy, but harmonious. He excels especially in heads and draperies. His works are of unequal merit, the later being generally inferior, but he is in many respects the most powerful master of the Milan school.

Among Ferrari's earlier works are a triptych representing a "Holy Family with Saints" (1511), for the church of Santa Maria at Arono, and an altarpiece for the church of Canobbio and for San Gaudenzio at Novara (1514–15). A number of his most important works are at Varallo, where he lived for a long time. In 1513 he had finished in the church of Santa Maria delle Grazie 20 frescoes of the "Life of Christ"—a wonderfully dramatic series in well-arranged, though sometimes crowded, groups. In the chapel of Santa Margherita, in the same church, he painted two frescoes of the "Life of Christ" (finished in 1515), and for San Gaudenzio a fine altarpiece, the "Marriage of St. Catharine"—perhaps the best of his earlier work. He frescoed the walls of three of the "stations" or chapels of the Sacred Mountain of Varallo and also modeled a number of terra-cotta groups in the other chapels of which the "Holy Family" and the "Adoration of the Magi" are the only ones that survive. Of these paintings, his great but much damaged "Crucifixion," in the thirty-eighth chapel, is the masterpiece. Its groups, in their symmetrical arrangement and the dignified heads and harmonious colors, challenge comparison with Raphael himself. In 1530–34 Ferrari decorated two chapels of the church of San Cristoforo, Vercelli, with frescoes of the "Life of the Virgin" and the "Life of St. Mary Magdalen," and in 1535 the cupola of the church of Saranno with a circle of "Singing Angels"—one of the finest existing specimens of such work. In 1542 he painted his fresco, "Scourging of Christ," in Santa Maria delle Grazie, Milan—a picture of grandiose effect. The "Martyrdom of St. Catharine," the best known of his pictures (Brera, Milan), is of the same character. Few of his works exist outside of Lombardy. In the Louvre there is an excellent "St. Paul," in the Berlin Museum an "Annunciation," and in the Historical Society of New York "St. George and St. Anthony of Padua."

Consult: Bordiga, *Notizie intorno alle opere di Guadenzio Ferrari* (Milan, 1821); Piannezza e Bordiga, *Le opere di Gaudenzio Ferrari* (Milan, 1835 and 1846); Zambelli, *Della vita e delle opere di Gaudenzio Ferrari* (Novara, 1869); Colombo, *Vita ed opere di Gaudenzio Ferrari* (Rome, 1881); Morelli, *Italian Painters* (London, 1892–93); Halsey, *Gaudenzio Ferrari* (ib., 1904).

FERRARI, Giuseppe (1811–76). An Italian historian and philosopher, born in Milan. He was educated at Pavia and held professorships successively at Rochefort, Strassburg, Turin, and Milan. In philosophy, especially in the philosophy of history, Ferrari was a disciple of his friend Romagnosi, and of Vico, whose works he edited and to whom he devoted one of his earliest volumes, *Vico et l'Italie* (1839). Of Ferrari's numerous historical works, may be mentioned: *Histoire des révolutions d'Italie* (1857–58); *L'Annexion des Deux-Siciles* (1860); *Corso sugli scrittori politici italiani* (1862–63); *Teoria dei periodi politici* (1874). For his biography, consult Mazzoleni (Milan, 1877).

FERRARI, Paolo (1822–89). An Italian dramatist and critic, born at Modena. His numerous plays show perfect mastery of stagecraft, and in his first manner, best represented by *Il codicillo dello zio Venanzio* (1847–48) and *La medicina d'una ragazza ammalata*, he creates as well some proverbial human figures. In the years 1851–56 he affected particularly the historical comedy, producing his masterpieces *Goldoni e le sue sedici commedie* and *Parini e la satira*. In his later years he followed the prevailing fashion of didactic comedy, as in *Cause ed effetti*, *Due dame*, and *Il duello*, where the serene contemplation of the artist observant of life tends to be sacrificed to the logical system of the thesis. His *Works* were published in Milan in 1877–80. Consult V. Ferrari, *Paolo Ferrari, la vita, il teatro* (Milano, 1899).

FERRA'RI-FONTA'NA, Edoardo (1878–). An Italian dramatic tenor, born in Rome. He studied medicine, but entered the diplomatic service in 1902 as secretary to the Consul at Montevideo. Here he took up music without a teacher and soon appeared in light operas. In 1906 he returned to Italy, where for four years he sang with ever-increasing success. His opportunity came at Turin, when the principal tenor of the Teatro Regio was suddenly taken ill. Thus Ferrari-Fontana made his début in grand opera on March 2, 1910, as Tristan in Wagner's drama. Although he had never studied with a teacher, his success was instantaneous and most emphatic, so that within two years he was regarded as one of the greatest interpreters of Wagner in Italy. Engagements followed in Rome, Naples, Milan, Bologna, and Buenos Aires. In this last city he met the distinguished contralto Margarete Matzenauer, whom he married in 1912. In June, 1913, he created the rôle of Avito in Montemezzi's *Amore dei tre re* at Milan and was immediately engaged by the Boston Opera Company. Both in Boston and New York his first appearances established him securely in high favor.

FERRARIS, fĕr-rä'rēs, Carlo Francesco (1850–). An Italian political economist and statistician, born at Moncalvo, Alessandria. He was a member of the Italian Bureau of Statistics from 1874 to 1876. In 1878 he became extraordinary professor at the University of Pavia, and in 1883 he was appointed a director in the Italian Ministry of Agriculture, Industry, and Commerce. He was called to the chair of statistics at Padua in 1885 and was a member of the Italian Chamber of Deputies in 1886–87. His works include: *La statistica e la scienza dell' amministrazione nelle facoltà giuridiche* (1878); *Moneta e corso forzoso* (1879); *Saggi di economia, statistica, e scienza della amministrazione* (1880); *L'Assicurazione obbligatoria, etc.* (2d ed., 1890); "Die Banken in Italien," in the *Handwörterbuch der Staatswissenschaften*, vol. ii (2d ed., 1899); *Principii di scienza bancaria* (1892); *Di alcuni caratteri internazionali dell' instruzione superiore* (1911).

FERRARIS, Galileo (1847–97). An Italian physicist and electrical engineer. He was born at Livorno, Piedmont, and was educated at the University of Turin and the Royal School of Engineering in that city, from which he graduated as a civil engineer in 1869. In 1872 he received the degree of doctor of mathematics, and in 1879 he became professor of physics in the industrial museum and military college at Turin, devoting himself to the study of technical physics. He was one of the foremost electricians in Europe and was sent by the Italian government as a delegate to various international electrical congresses and exhibitions, and was president of the department of electricity at the exhibition held at Turin in 1884. At that time he was engaged in an investigation of electrical transformers with a view to determining their efficiency and other properties. In subsequent experiments many additional data from both the practical and theoretical standpoint were accumulated, and further investigations carried on in August and September, 1885, resulted in the discovery of the rotary magnetic field. This was produced by two alternating currents with a quarter difference of phase and was in effect a revolving magnet in stationary apparatus and made possible the two-phase motor, such a machine being constructed and used by Ferraris in his laboratory in Turin in 1885. The investigation was described at length before the Royal Academy of Sciences of Turin, March 18, 1888. An important memoir by Ferraris, *On the Difference of Phase of Currents, on the Lag of Induction and on the Waste of Energy in Transformers*, was published in 1887 and treats thoroughly the subject in its many bearings. In 1893 he published a theory of the single-phase alternating motor, and towards the end of his life he was engaged in devising apparatus to transform alternating currents. The part played by Professor Ferraris in the development of alternating currents cannot be overestimated, and his works are considered standards.

FERRATA, Domenico, Cardinal (1847–1914). An Italian Roman Catholic prelate, born in Gradoli, near Montefiascone, and educated at Orvieto. In 1885 he became Bishop of Thessalonica and later he served as Papal Nuncio to Belgium and afterward to France. On June 22, 1896, he was created and proclaimed Cardinal by Leo XIII., with the titular see of S. Prisca. He was for a time Papal Nuncio at Paris and the German and Austrian politicians considered that he favored France. Head of the Congregation of the Sacraments and member of four other congregations, and president of the great eucharistic Congress held in Malta in 1913, in September, 1914, when Cardinal Della Chiesa had been chosen Pope, Ferrata was appointed Papal Secretary of State, a post for which he had been mentioned in 1901 upon the resignation of Rampolla.

FER′RATES (from Lat. *ferrum*, iron). Salts of the hypothetical ferric acid, including chiefly the barium, potassium, and sodium ferrates. See Iron.

FERREIRA, fâr-rā′ē-rȧ, Antonio (1528–69). One of the classic poets of Portugal. He was born at Lisbon and was educated at Coimbra, where he occupied himself especially with the study of the Italian and Latin authors, for his bachelor's degree received in 1551, and where he remained for some years as professor of jurisprudence, after receiving his doctor's degree in 1555. In 1558 he married Dona Maria Pimentel, who inspired the sonnets of book ii of his collected poems. His wife's death, after a short and happy married life, added to the natural austerity of his style. In 1567 he received an important civil appointment at the court of Lisbon, where he resided until his death from the plague. His poems show how much he regretted the change from the delightful surroundings at Coimbra. His renown was gained even during his lifetime, despite the fact that he never published a collection or edition of his works. Of all the followers of Sá de Miranda, he was most successful in imitating the Italian and Latin forms of verse, perfecting the elegiac and epistolary styles already attempted by Miranda and transplanting into Portuguese literature the epithalamium, the epigram, and the ode. His *Ines de Castro* is the earliest Portuguese tragedy and, with the exception of Trissino's *Sophonisba*, the earliest in Europe, after the revival of letters. It was translated into English by Musgrave (London, 1825). His comedies, *Bristo* and *Cioso*, both early works, are full of interest to the student of literary history. The second was translated into English by Musgrave (London, 1835). Consult: Castilho, *Antonio Ferreira* (3 vols., Rio, 1865); Braga, *Historia dos Quinhentistas* (Oporto, 1871); and the *Complete Works of Ferreira* (2 vols., Paris, 1865).

FERREIRA, Thomaz A. R. See Ribeiro-Ferreira, Thomaz Antonio.

FERREIRO, fĕr-rā′ē-rô (Portug., smith; from its cry). A Brazilian tree frog, or "escuerzo" (*Hyla faber*), 3½ inches in length, remarkable for its breeding habits. In February these frogs resort to muddy pools, where mating takes place, and the females form from the mud beneath the water circular walls, which rise 2 to 4 inches above the surface and inclose pools a foot or so in diameter, in which the eggs are laid, and where the tadpoles remain until well grown. These circular nurseries are constructed with much care by the females alone, each meanwhile carrying her male mate upon her back, waiting to fertilize her eggs. The work is done at night. Consult Goeldi, *Proceedings Zoölogical Society of London*, pp. 90–97 (1895).

FER′REL, William (1817–91). An American meteorologist. He was born in Bedford Co., Pa., and early removed to Virginia. He was educated at Marshall College (Mercersburg, Pa.) and at Bethany College (Virginia), graduating from the latter institution in 1844. His meteorological researches won attention, both in America and Europe, and it may be said that many of the fundamental propositions of meteorology were laid down by him. He was associated as assistant in the computations of the *Nautical Almanac* until 1867, when he was appointed to the United States Coast and Geodetic Survey. From 1882 to 1886 he was stationed at Washington, as an assistant in the Signal-Service Bureau, where he continued his independent investigations. His maxima and minima tide-predicting machine has been for many years in general use in the government coast surveys. Among his literary productions may be mentioned: "The Problem of the Tides," in Gould's *Astronomical Journal* (1856); *Converging Series Expressing the Ratio of Diameter and Circumference of Circles* (1871); *Tidal Researches* (1874); *Meteorological Researches* (3 vols., 1877–82); *Popular Treatise on the Winds* (1889; 2d ed., 1898).

FERRER (y Guardia), fĕr′rĕr ē gwär′dyȧ, Francisco (1859–1909). A Spanish revolutionist, born at Alella, near Barcelona. At the age of 13 he went to work in Barcelona and soon became a freethinker. From 1877 to 1885 he was a railway employee. He took part in the Catalonian rebellion of 1885 and then went to Paris, where he was secretary to Ruiz Zorrilla, former President of the Spanish Republic, became a teacher of Spanish and a friend of the radical Senator Nacquet, and inherited about $150,000 from one of his pupils. He seems to have been a member of the Grand Orient in Paris. In 1901 he went back to Barcelona and established a "Modern School" (Escuela Moderna), antireligious and anarchistic in its teachings. He was accused of complicity in the attempted assassination by Mateo Moral (who had been his librarian) of the King and Queen of Spain in May, 1906, but was acquitted in June, 1907. In 1909 he went to England, but hurried back to Spain when word came of the Riff rising, and was accused of being a leader in the attempt to seize Barcelona and set up a provisional, republican, and anti-Catholic state. He was tried, found guilty, and shot on Oct. 13, 1909. His death created a great outcry against Spain and Catholicism abroad and a ministerial crisis at home. The question of his guilt is possibly an open one. Consult McCabe, *Martyrdom of Ferrer* (New York, 1909), and Archer, *Life, Trial, and Death of Ferrer* (1911), which magnify his virtues and the injustice done him as much as Catholic writers on the subject overestimate his guilt; and see McCabe's version of *Origins and Ideals of the Modern School* (New York, 1911).

FERRERO, fĕr-rā′rô, Guglielmo (1872–). An Italian historian, born near Naples, the son of a Piedmontese railway engineer. He studied law at Pisa and belles-lettres at Bologna under Carducci, but the important factor in his education was his collaboration with Lombroso on *La donna delinquente* (1893; *The Female Offender*, in English, 1895). With Bianchi and Sighele he wrote *Il mondo criminale italiano* (1893–94), for which Lombroso wrote a preface. Ferrero married his master's daughter, Gina Lombroso, herself a psychologist and criminologist and author of a sketch of her father's work. He had taken some interest in politics and in

1891 had been banished a few months for Socialism, and for several years he made a great success as a publicist. In 1898 he lectured on militarism in Milan. His main work was a history of Rome. To this work, *Grandezza e decadenza di Roma* (1902–08; in English, *Greatness and Decline of Rome*, 1907–09), he brought the training of a psychologist with some knowledge of economics. The work is more ambitious than scholarly and is singularly bold in its criticism of the Latin and Greek historians. In 1906 he lectured at the Collège de France; in 1907 traveled in South America; and in 1908 visited the United States, lectured at the Lowell Institute and elsewhere, and published *Characters and Events of Roman History*. He also wrote *Fra i due mondi* (1913; English version, *Between Two Worlds*) and *Ancient Rome and Modern America: A Comparative Study of Morals and Manners* (1914). For a critique, especially of his far-fetched modernism, consult Besnier, "L'Œuvre de M. Guglielmo Ferrero," in *Revue Historique*, vol. xcv, pp. 54–74 (1907).

FER'RET (Fr. *furet*, It. *furetto*, from ML. *furetus*, dim. *furo*, ferret, from Lat. *fur*, thief; apparently connected by popular etymology with Lat. *fera*, wild beast). 1. An animal of the weasel family (Mustelidæ), so nearly allied to the polecat (*Putorius fœtidus*) that many regard it as a mere domesticated albinotic variety. Others regard it as a distinct species, which they call *Putorius furo*. It is of rather smaller size, the head and body being about 14 inches long, the tail 5½ inches, the muzzle somewhat longer and more pointed, the head rather narrower; the color is very different, being yellowish, with more or less of white in some parts, due to two kinds of hair—the longer partly white, the shorter yellow. The eyes are pink. It is, however, much more susceptible to cold than the polecat and requires careful protection from it in climates where the polecat is a hardy native. It was imported into Europe from Africa and was used in Rome as a mouser. Attention to warmth and cleanliness is essential to the health of ferrets. They are capable only of partial domestication, acquiring a kind of familiarity with man, and submitting with perfect quietness to his handling, but apparently never forming any very decided attachment; and they never cease to be dangerous if not carefully watched, especially where infants are within their reach. If allowed any measure of freedom, they are ready to attack poultry and kill far more than they can devour, merely sucking the blood. They generally breed twice a year, each brood consisting of six or nine. The female sometimes devours her young, in which case another brood is speedily produced. Consult: Everitt, *Ferrets: Their Management* (London, 1897); Johnston, *British Mammals* (ib., 1903); Millais, *Mammals of Great Britain and Ireland* (ib., 1904–06). See Plate of FUR-BEARING ANIMALS.

2. In the Western United States, a weasel of the plains, the black-footed ferret (*Putorius nigripes*), which lives in the prairie-dog "towns," feeding on those animals. It is pale brown, with the feet, tip of tail, and a bar across the face black. It is about 2 feet long.

FERRETING. The ferret is bred and trained in captivity. Rabbits have the same instinctive apprehension of coming danger from the presence of the ferret that birds in general have of the sky-flying hawk, and hunters take advantage of this characteristic. They breed the ferret and place it—sometimes free, sometimes on a string, and sometimes muzzled—in the burrows or underground runs in a rabbit warren, from which its presence causes the rabbits to scurry off into the open fields. The young ferrets are taught by being entered in the first instance with their mother. Ferrets are equally efficacious in starting rats from their underground homes or from the bottom of grain stacks, where they do great damage. The use of ferrets in hunting is prohibited in many of the United States and is discountenanced by most conservative sportsmen, except where rabbits have become so plentiful as to be pests.

FER'REX AND POR'REX. See GORBODUC.

FERRI, fĕr'rē, CIRO (1634–89). An Italian painter, born in Rome. He was the pupil of Pietro da Cortona and so imitative of that master that it is difficult to distinguish their pictures. Ferri is usually the inferior in color, vigor, and grace of design. After the death of Pietro he completed the latter's unfinished works, notably the frescoes in the Pitti Palace, Florence. Ferri's principal works are the frescoes of biblical subjects in Santa Maria Maggiore at Bergamo, a fine "St. Ambrose" in Sant' Ambrogio della Massina, Rome, and the frescoes in the cupola of Sant' Agnese, Rome, which were completed after his death and partially marred by Corbellini. Among his easel pictures are: "Dido and Æneas" (Dresden Gallery); "Madonna" (Munich); "The Triumph of Bacchus" (Hampton Court); "Christ Appearing to Mary Magdalen" (Vienna); "Alexander Reading Homer"; his own portrait; and "Christ on the Cross" (Uffizi Gallery, Florence). He is also known by skillful miniature drawings for religious works of the time. His most important pupil was Gabiani.

FERRI, ENRICO (1856–). An Italian criminologist, born at San Benedetto-Po, Mantua. He studied at Bologna, Pisa, and Paris, lectured at various Italian universities, and later practiced law at Rome. In 1886 he became a Socialist member of the Chamber of Deputies. His publications include: *Sociologie criminelle* (1893; published in Eng. trans. as *Criminal Sociology*, New York, 1896, in the "Criminology Series"); *La scuola positiva di diritto criminale* (1883; Eng. trans. by E. Untermann, *The Positive School of Criminology*, 1906); *Difese penali e studi di giurisprudenza* (1898); *Deliquenti nell' arte* (1901).

FERRI, LUIGI (1826–95). An Italian philosopher, born at Bologna. He was educated in France and taught in several of the French colleges before he settled in his native country. After occupying the chair of philosophy and history at the Institute of Florence (1863), he was called to the same position at the University of Rome (1871). While there he became corresponding member of the Institute of France and editor of *Rivista italiana di filosofia*. His works include: *Il genio d'Aristotele* (1866); *Il senso commune nella filosofia* (1872); *La psicologia di Pietro Pompanazzi* (1877). In French he wrote: *Essai sur l'histoire de la philosophie en Italie au XIXème siècle* (1869) and *La psychologie de l'association depuis Hobbes jusqu'à nos jours* (1883). He represented in philosophy a spiritualism akin to Cousin's, whose pupil he was.

FERRIC OXIDE, or SESQUIOXIDE OF IRON. See IRON; HEMATITE.

FER'RICY'ANIDE OF POTAS'SIUM. See HYDROFERRICYANIC ACID.

FER'RIER, SIR DAVID (1843–). A Scottish neurologist. He was born in Aberdeen, Scotland, studied at Aberdeen and Edinburgh in Scotland and at Heidelberg in Germany, and for many years after 1889 was professor of neuropathology in King's College, London. He also became consulting physician to King's College Hospital and to the National Hospital for Paralyzed and Epileptic. In 1911 he was knighted. His researches on the functions and the diseases of the brain have formed contributions of the highest importance to the science of medicine. He published: *The Functions of the Brain* (1876; new ed., 1886); *The Croonian Lectures on Cerebral Localization* (1878, 1890). He was also a founder and an editor of *Brain: A Journal of Neurology.*

FERRIER, fâr'yâ', GABRIEL (1847–1914). A French painter, born at Nîmes. He studied under Pils, Lecoq de Boisbaudran, and Hébert, and won the Prix de Rome in 1872. In 1878 his "St. Agnes" (now in the Rouen Museum) obtained a first-class medal at the Paris Exposition, and in 1889 his "Mothers Cursing War" (Amiens Museum) received the same honor. He was awarded the medal of honor in the Salon in 1903. His drawing is excellent and his handling free, vigorous, and sincere. His portraits, of which that of General André in the Luxembourg is a good example, are strong and realistic. His other works include: "Spring"; a portrait of Baroness Akermann (Munich Pinakothek); "Sorrow" (Luxembourg Museum, Paris); and "The Dead Christ" (Nîmes Museum). He painted decorations in the Hôtel de Ville, the Sorbonne, and the Palais d'Orsay, Paris, and became a member of the Institute, an officer of the Legion of Honor, and a professor at the Ecole des Beaux-Arts.

FER'RIER, JAMES FREDERICK (1808–64). A Scottish metaphysician, born in Edinburgh. He graduated at Oxford in 1831, was elected to the chair of civil history in the University of Edinburgh in 1842 and in 1845 to that of moral philosophy and political economy in the University of St. Andrews, where he remained until his death. According to Ferrier's "theory of knowing and being," which was elaborated under the influence of Kant and his successors, the ego enters as an essential constituent into every conception that the mind is capable of forming. The connection between the conceiving conscious mind and conceivable being is intimate and indissoluble. To be knowable, *object* must coexist with *subject,* and it is fallacious to speak even of our *ignorance* of "matter *per se*"; for while we may be ignorant of what could possibly be known, we cannot be ignorant of what is absolutely unknowable—what is neither an entity nor a nonentity—the material world *by itself.* Ferrier's works include the *Institutes of Metaphysic* (1854) and *Lectures on Greek Philosophy and Other Philosophical Remains of J. F. Ferrier,* published posthumously (1866).

FERRIER, fâr'yâ', PAUL (1843–). A French dramatist. He was born at Montpellier and became an officer of the Legion of Honor. His plays include: *La revanche d'Iris* (1868); *Chez l'avocat* and *Les incendies de Massoulard* (1873); *Les compensations* (1876); *Les mousquetaires au couvent* (1880); *Babolin* (1884); *Tabarin* (1885); his greatest success, *Joséphine vendue par ses sœurs* (1886), with music by Victor Roger; *Le fétiche* (1890); *Calendæ* (1894); *Le carillon* (1896); *La belle-mère* (1898); and the opera libretti, *La Marocaine* (1879), *Le chevalier d'Harmental* (1896), and *La fille de Tabarin,* with Sardou (1901).

FER'RIER, SUSAN EDMONSTONE (1782–1854). A Scottish novelist. She was born in Edinburgh. Her first work, *Marriage,* appeared in 1818, and this was followed by *The Inheritance* (1824) and *Destiny* (1831). The merit of these tales, which are characterized by genial wit, a quick sense of the ludicrous, and considerable ability in the delineation of national peculiarities, is sufficiently proved by the fact that they have held their ground, notwithstanding the enormous number of novels which have flowed from the press since their publication. Like her friend, Sir Walter Scott, she owes a debt to Maria Edgeworth, who in *Castle Rackrent* (London, 1800) showed how to make provincial manners and life the material of fiction. Her novels were edited by Johnson (London, 1893). Consult her *Memoirs and Correspondence,* edited by Doyle (London, 1898).

FERRIÈRES, fâr'ryâr'. A village in the Department of Seine-et-Marne, France, 17 miles southeast of Paris (Map: France, S., H 4). It has an interesting thirteenth-century church, but is chiefly famous for the splendid château (built 1860) in modern Renaissance, which was the headquarters of King William of Prussia from Sept. 19 to Oct. 5, 1870, and in which Jules Favre unsuccessfully attempted to negotiate an armistice with Prince Bismarck. The château is the property of Baron Alfonse Rothschild. Pop. (commune), 1901, 961; 1911, 815.

FER'RIS, ALBERT WARREN (1856–). An American psychiatrist, born in Brooklyn, N. Y. He graduated from New York University in 1878 and from the College of Physicians and Surgeons (Columbia University) in 1882, was an interne for two years, and at various times was assistant resident physician in several private sanitariums for insane or nervous patients. In 1892 he took up the practice of medicine in New York City, serving also as assistant in medicine at the University and at Bellevue Hospital Medical College and as assistant in neurology at the College of Physicians and Surgeons. He was a consulting physician to the Italian Hospital, New York, and to the Binghamton State Hospital; for a time was senior resident physician at the Glen Springs, Watkins, N. Y.; and in 1913 became medical expert to the State Reservation Commissioners at Saratoga Springs. At various times he was on the staffs of the *American Medico-Surgical Bulletin,* the *Medical Critic,* and the *State Hospitals Bulletin;* he also contributed to the NEW INTERNATIONAL YEAR BOOK and to the NEW INTERNATIONAL ENCYCLOPÆDIA. In 1907–11 he was president of the New York State Commission in Lunacy.

FER'RIS, ISAAC (1798–1873). An American clergyman. He was born in New York City and graduated at Columbia College in 1816. He served as bombardier at the Battery, New York City, during the War of 1812, under his father, Capt. John Ferris. After teaching Latin at the Albany Academy, he studied theology under the Rev. Dr. John Mitchell Mason and at the Reformed Dutch Church Seminary, New Brunswick, N. J., where he graduated in 1820. He was successively pastor at New Brunswick, N. J. (1821–24); Albany, N. Y. (1824–36);

and in the Market Street Dutch Reformed Church, New York City, the fashionable church of the old Seventh Ward (1836–53). He was president of the New York Sunday-School Union from 1857 to 1873, organizer and president of the Board of Foreign Missions of the Dutch Reformed Church, founder and president of Rutgers Female Institute, and third chancellor of the University of the City of New York, serving from 1852 to 1870, and by his admirable management relieving the institution from the debt which had encumbered it since its foundation. His publications include *Memorial Discourse; or, Fifty Years' Ministry in the Reformed Church of America* (1871).

FERRIS, John Mason (1825–1911). An American clergyman, born at Albany, N. Y. In 1843 he graduated from New York University (A.M., 1846), and he also studied at the New Brunswick Theological Seminary for three years. Ordained to the Dutch Reformed ministry in 1849, he thereafter held pastorates at Tarrytown, N. Y. (1851–54), Chicago (1854–62), and Grand Rapids, Mich. (1862–65). In 1864–65 he was a professor in the Western Theological Seminary (Holland, Mich.), and from 1865 to 1883 he was secretary and in 1886 treasurer of the Board of Foreign Missions of the Dutch Reformed Church. From 1881 to 1906 he was editor of the *Christian Intelligencer*.

FERRIS, Woodbridge Nathan (1853–1928). An American educator and public official. He was born at Spencer, N. Y., and was educated in the Oswego (N. Y.) Normal and Training School and the medical department of the University of Michigan. He served as principal of a business college and academy at Freeport, Ill. (1875–76) and of a similar institution at Dixon, Ill. (1878–79), as professor in Rock River University, Dixon (1876–77), and as superintendent of schools at Pittsfield, Ill. (1879–84). Removing to Big Rapids, Mich., he founded (1884), and was thereafter president of, the Ferris Institute. He became president of the Big Rapids Savings Bank. After once (1904) failing of election as Governor on the Democratic ticket, he was elected (1912), and again 1914. In this office he aroused considerable criticism by his management of the strike situation in the Michigan copper mines.

FER′RO (Sp. *Hierro*). The most westerly and smallest of the Canary Islands (q.v.), having an area of about 105 square miles (Map: World, Eastern Hemisphere, G 19). It is of volcanic origin, rising to an altitude of 4640 feet. Pop., 1910, 7667. It lacks running water and springs and is not fertile but produces some grain and wine. Ferro has been regarded as the most westerly point of the Old World. Geographers at one time reckoned longitude from the meridian of the island, and this custom prevailed with German cartographers until recently. The meridian of Ferro is 17° 40′ W. of Greenwich. Chief place, Valverde.

FERROL, fâr-rōl′ (Lat. *Ardobrica*), El. A seaport in the Province of Coruña, Spain, situated on a narrow arm of the Bay of Betanzos, 12 miles northeast of Coruña (Map: Spain, F 5). Originally a fishing town, it was selected for its natural advantages as a seaport by Charles III, who erected here for the Spanish navy what was at one time the finest naval arsenal in the world. The arsenal, with dockyards and shops, covers an area of about 24 acres and is still one of the largest shipbuilding centres in Spain. A naval school is maintained in connection with it. Entrance to the harbor of El Ferrol is gained only through a very narrow strait, which is defended by the castles of San Felipe and Palma. The town, strongly fortified also on the land side, consists of three distinct sections, of which Ferrol Nuevo is most notable. Here are many of the finest buildings of the city, and the streets are wide and regular. El Ferrol has several squares and pleasant alamedas or promenades. The Plaza de Armas is the site of a fine memorial fountain to Churruca, a celebrated naval officer. The city has manufactures of sailcloth, leather, spirits, chocolate, linen, and hardware, and carries on an important trade. The fisheries also constitute an extensive industry. Pop., 1900, 26,257; 1910, 26,270. El Ferrol appears first in history in the early years of the thirteenth century, but it did not attain any particular importance until its development in the eighteenth century as a naval station. An unsuccessful attack on the port was made in 1800 by the English. It was captured by the French in 1809 and in 1823.

FERRON, fâ′rôN′, Théophile Adrien (1830–94). A French general, born at Pré-Saint-Evroult, Eure-et-Loire. He studied at the Ecole Polytechnique, entered the engineers in 1852, and rose to be colonel in 1878 and a general of division in 1886. He distinguished himself in the Crimea, was a professor of military science in the Ecole d'Application at Metz, became connected with the Ministry of War in 1880, and held the portfolio of War in 1887 (May 30–November 20). His publications comprise: *Considérations sur le système défensif de la France* (1873); *Considérations sur le système défensif de Paris* (1875); *Instructions sommaires sur le combat* (1883); *Quelques indications pour le combat* (1892).

FER′ROTYPE (from Lat. *ferrum*, iron + Gk. *τύπος*, *typos*, type), or Tintype. A photographic print made on a plate of enameled iron previously coated with black varnish, and immersed first in collodion and then in a sensitive silver solution. After a few seconds' exposure the operator proceeds at once to develop, fix, and wash the plate, on which the picture, though really nothing but an insufficiently exposed or poorly developed negative, appears like an ordinary photograph, owing to the dark color of the background. Consult Estabrooke, *Ferrotype, and How to Make It* (Cincinnati, Ohio, 1872). See Photography.

FERRUCCI, fĕr-rōō′chē, Andrea (1465–1526). A Florentine sculptor, born at Fiesole. He was a pupil of Francesco di Simone Ferrucci and Michele Maini at Florence. He has much of the pure devotional charm of Mino, Rossellino, and Desiderio, although his later works, especially the "St. Andrew" (Florence Cathedral), show the influence of Michelangelo. From 1512 to 1518 he was superintendent of the works of the cathedral for which he executed an original and lifelike bust of Marsilio Ficino and a statue of St. Andrew. His masterpiece is the marble baptismal font in the cathedral of Pistoia, carved in relief with scenes from the life of Christ and John the Baptist. The composition is of great beauty, and the architectonic structure excellent, although the figural part is subordinated to the ornamental, as in all his creations. Other works are a marble reredos of exquisite detail, with an "Annunciation" in two medallions, in the cathedral of Fiesole; a "Holy Family," in the Bargello, Florence; the tomb of the Saliceti, in San Martino, Bologna; and the decoration of the aisle of San Martino for Ferdinand I of Naples. The tomb of Antonio Strozzi, in Santa Maria Novella, Florence, which was begun by Ferrucci, was completed by his pupil Casini and Tommaso Boscoli.

FER'RY (from AS. *ferian*, to carry, Goth. *farjan*, to row, causative of AS., Goth., OHG. *faran*, Ger. *fahren;* connected with Gk. *περᾶν*, *peran*, Skt. *par*, to cross). A passage by boat, generally across a comparatively narrow waterway not readily provided with a bridge. Common rowboats are generally used for ferrying foot passengers, but when horses and carriages or motor vehicles have to be taken across, a flat-bottomed barge may be used, propelled by oars or carrying sails; or drawn by a rope, either by manual labor or the force of the current, as noted below. Such boats are sufficient for light traffic, but where the traffic is heavy, or the crossing broad, power-propelled ferryboats are used.

Flying Bridge is the name sometimes given to a kind of ferryboat which is moved across a river by the action of the combined forces of the stream and the resistance of a long rope or chain made fast to a fixed buoy in the middle of the river. The boat thus attached is made to take an oblique position by means of the rudder; the stream then, acting against the side, tends to move it in a direction at right angles to its length, while the rope exerts a force in the direction towards the buoy. The course of the boat and the action of the two forces are analogous to the path of a rising kite and to the forces of which this path is the resultant. The holder of the kite corresponds to the buoy, the wind to the tidal stream, and the tail to the rudder.

Steam Ferryboats, until recently, were propelled by a paddle wheel at each side, driven by a walking-beam engine. There was but one deck, placed a few feet above the water. This is still a common type, but the larger boats built since 1890, particularly those for service at New York City and at San Francisco, usually are driven by means of screw propellers and have two decks. This affords spacious cabins on the lower decks, makes a commodious and well-lighted saloon with an outer promenade possible on the second deck, increases the speed and mobility of the boats, and lessens the troubles caused by ice. The first of these double-screw ferryboats at New York was the *Bergen*, running between New York and Hoboken. It was put in use in 1889. A later boat of the same general type and, on account of the long ferry, a particularly large one, was the *Berkeley*, built for the Southern Pacific Railway Company, to run between San Francisco and Oakland, Cal., and put in service in 1898. Other notable ferry steamers have been built for service in San Francisco Bay, while of large and modern construction are the municipal ferry steamers of the city of New York running between Manhattan and Staten Island. The use of tubes or tunnels, such as the Hudson and Manhattan and Pennsylvania tube between New York and New Jersey, has served to cut down the importance of ferries for passengers, especially in connection with railway terminals; but the increased use of motor vehicles has in many places given them a new importance.

With the increase of electric interurban railways and the extended use of motor vehicles, a new form of ferryboat has been developed, viz., one where internal-combustion motors have been fitted to a shallow-draft vessel so that a river of considerable width, where conditions do not permit the construction of a bridge, may be crossed. Various types of such craft have been developed on the Ohio River and elsewhere in the United States.

Ferry Houses are provided at each end of important ferries. They contain ticket offices and waiting rooms and often a great variety and number of accessories, like news and flower stands and restaurants. To accommodate the landing places to the rise and fall of the tides, or other variations in the water level, bridges are provided, with the shore end made fast and the water end free to rise and fall with the water. The boats run into slips, formed of fenders, or piles covered with planking.

Car-Transfer Boats are used to convey trains of cars across streams or other bodies of water where bridges or tunnels are impracticable or the distance too great. In many instances, as in the case of the vast numbers of freight cars transferred at New York City, the trains are broken up into short sections and run upon flatboats, which, when loaded, are towed by tugboats. In this manner the wharves and waters adjoining New York, Hoboken, and Jersey City are made to serve the same purpose as hundreds of acres of switching yards, while at the same time the cars are being transferred from one railway to another or to various loading piers. Instead of mere flatboats, moved by tugs, some transfer boats are self-contained. Such a vessel, the *Maryland*, for many years was employed in New York harbor to transfer the Boston-Washington expresses from Harlem River to Jersey City. This service was abandoned in 1912. Probably the longest water-transfer route of this sort is that across Lake Michigan, from Frankfort, Mich., to Kewaunee, Wis., a distance of 63 miles. It was put in operation in 1892 by the Toledo, Ann Arbor, and Northern Michigan Railway Company. Each boat carries 24 cars, placed on four parallel tracks, and is driven by three screw propellers. The boats are designed to break their way through ice, and the usual construction is with a solid bow with access for the cars at the rear to the tracks laid on the main deck. In 1911 a vessel 363 feet in length, with a capacity of 30 42-foot cars, was put in service by the Ann Arbor Railroad Company between Frankfort, Mich., and Manitowoc, Wis. Special bridges are used to transfer the cars from the land to the boats. From Grand Haven to Milwaukee there is a car ferry where a large vessel, 350 feet in length, having a capacity of 30 loaded freight cars, is employed. A ferry service is maintained between Rochester, N. Y., and Coburg, Ontario, a distance of 56 miles, the steamer *Ontario* being able to transport 30 50-ton coal cars. In 1914 a second steamer of 500 tons, 317 feet in length and 56-foot beam, was ordered, able to accommodate 28 freight cars and 900 passengers. One of the largest and most modern of American car ferryboats, the *Contra Costa*, 433 feet, 4 inches in length, 66 feet, 6 inches in beam, and with a depth amidships of 19 feet, 9 inches, was launched and put into service in 1914. This ferryboat was built for service on San Francisco Bay to handle the freight and passenger cars of the Southern Pacific Railway. It carried four tracks, spaced so as to give a clearance of 3 feet, 6 inches between cars of normal width, and had a capacity of 36 freight cars and two locomotives, or two locomotives and 24 passenger cars. See PUBLIC UTILITIES, REGULATION OF.

A car ferry across Lake Baikal, a distance of 28 miles, on the line of the Trans-Siberian Railway, was opened in 1900 and was interesting on account of the vessel's having to serve as an ice breaker in addition to being a transport. The boat, which had an over-all length of 290 feet, was fitted with three propellers, one in the bow and two astern. It was able to break through ice 39 inches thick. In Europe the ferry between Sassnitz and the Isle of Rügen, on the north coast of Germany, and Trelleborg, on the south end of Sweden, a distance of 65 miles, employs twin-screw steamers that carry complete trains. These vessels, 370 feet in length, with a speed of 16½ knots, are very seaworthy, being built with solid bows for heavy weather, and at the landings are backed into position, the cars being switched on board through doors in the rear. The cars are jacked up and made fast by chains so that they cannot roll in rough weather. A ferry of this type is planned to transfer cars from the island of Key West, Florida, to Havana, Cuba, a railway having been already constructed to connect Key West with the mainland.

In law the right to maintain a ferry is a franchise, created by a grant from the sovereign power of the state, and is a property right of the class known as incorporeal hereditaments. The owner of this franchise has, as an incident thereto, the right not only to pass over the water, but to use the highway on either side for the conduct of his business. Indeed, a ferry is the continuation of the highway from one side of the water over which it passes to the other, although subject to the public right of navigation in such water. Any one who unlawfully invades the valid ferry franchise of another is liable at common law in damages to the latter and may be enjoined by the Court of Chancery from further interference. Such violation may amount to a crime at common law or under modern statutes. Correlative to these legal rights of the ferry owner are certain well-defined legal duties. Having received a public franchise, he is bound to serve the public faithfully and impartially. He must have suitable boats, docks, and accommodations; he must employ proper servants and agents, and his tolls must be reasonable. If he fails in the performance of any of these duties, he may be liable to a private action for damages, to a criminal prosecution, or to the forfeiture of his franchise. His liability for the safety of passengers and of freight is that of a common carrier (q.v.). See FRANCHISE; and consult: Glen, *Law Relating to Highways, Bridges, and Tramways* (2d ed., London, 1897); Pratt, *Law of Highways, Main Roads, and Bridges* (16th ed., ib., 1911); Washburn, *Treatise on the American Laws of Real Property* (6th ed., Boston, 1902).

FERRY, fĕ'rē', JULES FRANÇOIS CAMILLE (1832–93). A French statesman and journalist. He was born at Saint-Dié, in the Department of Vosges, April 5, 1832. Admitted to the bar in Paris in 1851, he became connected with the *Gazette des Tribunaux*, joining the group of young lawyers who opposed the Empire. He was among the famous 13 condemned to imprisonment in 1864. In 1865 he became a writer on the *Temps*, where his brilliant political articles attracted much attention. In 1869 he was elected to the Corps Législatif taking his seat among the members of the Left. He demanded the dissolution of the Corps Législatif and was a powerful opponent of Ollivier. He voted against the declaration of war with Prussia. After the fall of Sedan he and the other Paris deputies were proclaimed members of the Government of the National Defense, Sept. 4, 1870. Ferry was secretary of this body and as prefect of the Seine administered Paris during the siege in alliance with Thiers. He was elected one of the representatives of the Department of the Vosges, and resigned his place in the government in 1871. In 1872 he was appointed Minister to Greece by Thiers, but resigned the position the following year. On the fall of Thiers, he returned to Paris and, entering the National Assembly, conducted an energetic struggle against the monarchical elements that threatened to submerge the infant Republic. He contributed to the fall of M. de Broglie in 1874 and in his brilliant speeches foreshadowed the anticlerical policy for which he is best known. In 1877 he opposed MacMahon's monarchical plans and contributed to a Republican triumph in the elections of 1879. He initiated the policy of republicanizing the personnel of the administrative and judicial departments. When Grévy became President of the Republic in 1879, Ferry was appointed Minister of Public Instruction and initiated his policy of breaking the control over popular education which the Church had obtained since 1850. In March, 1879, he secured the passage of the famous Ferry laws which suppressed the right claimed by the congregations of appointing teachers to the public schools without degrees, for the exclusion of the clergy from university councils, and the abolition of their right to confer degrees. It was Article 7 of this law about which the battle raged; it deprived every congregation that did not obtain the authorization of the state—the Jesuits in particular—of the right of imparting instruction. The year following he became President of the Council and Prime Minister, but on Nov. 14, 1881, resigned on account of the attacks made on his policy in regard to Tunis. By the Law of June 16, 1881, the schools of the Republic were organized, and the following year education was made free, secular, and obligatory. A system of normal schools was established and, in the face of the opposition of the Church, a scheme for the education of the women of the middle classes. In 1882 he was Minister of Public Instruction under Freycinet, and in the following year became Prime Minister again. In all of these positions he manifested bitter hostility to the Jesuits and was largely instrumental in securing their banishment from France. In 1885 the unsatisfactory result of the war in Tonkin, which culminated in the defeat of the French at Langsun, on the Chinese frontier, led to Ferry's final resignation, March 30. His colonial policy, which had mere economic exploitation as its aim with Bismarckian tactics as a means, was the cause of his political failure. In spite of his loss of political power he was still an influential member of the Chamber of Deputies, and in December, 1887, was a candidate for the presidency, but was defeated. A few days after the election he was wounded by a pistol shot fired by a fanatic named Aubertin in the lobby of the Chamber of Deputies. In 1889 he failed to be reëlected to the Chamber, but in January, 1891, was chosen senator. He came unscathed through the Panama scandal and was made President of the Senate, Feb. 24, 1893. He died shortly after, March 17, 1893. Consult: Sylvin, *Célébrités contemporaines* (Paris, 1883); King, *French Political Leaders* (New York, 1882); Rambaud, *Jules Ferry* (Paris, 1903); Ferry, *Discours et opinions* (ib., 1893–98); Hanotaux, *Histoire de la France contemporaine* (4 vols., Eng. trans., 1903); G. Weill, *Histoire du parti républicain en France* (Paris, 1900); A. Debidous, *L'Eglise catholique et l'état de 1870–1906* (2 vols., ib., 1906).

FER′RY, Orris Sandford (1823–75). An American legislator. He was born at Bethel, Conn., and graduated at Yale in 1844. He was a probate judge from 1849 to 1856, and a member of the State Senate from 1855 to 1857, as a member of the American party. He was elected a member of the Thirty-sixth Congress as a Republican in 1859 and formed one of the celebrated Committee of Thirty-Three, organized to consider the condition and relation of the seceded States. In July, 1861, he recruited and became colonel of the Fifth Connecticut Volunteer Infantry, and he was commissioned a brigadier general of volunteers by President Lincoln March 17, 1862, in which capacity he served to the close of the war. In 1866 he was elected to the United States Senate as a Republican, but his independence, and his opposition to the Civil Rights Bill in particular, threw him out of line with his party, and he was reëlected in 1872 by a combination of Liberal Republicans and Democrats, defeating General Hawley, the regular Republican candidate. He continued to act with the Republicans, however, and supported the Grant administration, taking a leading part in framing the legislative acts that provided for carrying out the President's policy.

FERRY, fĕ′rē′, Paul (1591–1669). A French clergyman, who was born at Metz and spent his entire life there. He was the author of a number of unimportant works. A certain interest attaches to a correspondence he had with Bossuet (1666–67) upon the reunion of the Protestant and Catholic churches. His *Catéchisme général de la réformation de la religion* (1654) provoked a refutation from Bossuet. He is said to have received a pension from Richelieu for agitating this question.

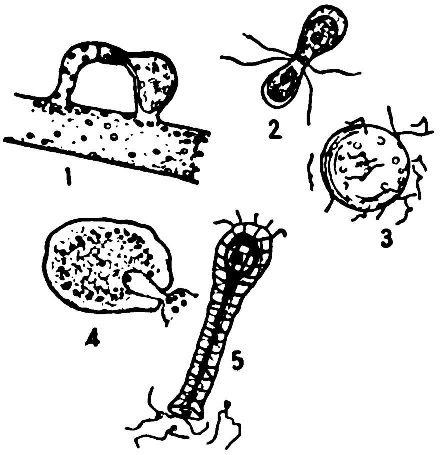
FERRY, Thomas White (1827–96). An American Republican politician, born in Mackinac, Mich. He was a member of the State Legislature for some time and from 1865 to 1871 was a member of the House of Representatives. He then served in the United States Senate for two terms, acting for much of the time as President pro tempore, and, on the death of Henry Wilson, was President of the Senate in 1875–77.

FER′RYLAND. An old-time port of entry, capital of Ferryland District, Newfoundland, 34 miles south of St. John's (Map: Newfoundland, H 5). It has a fine harbor and lighthouse. As Avalon, it was founded in 1624 by Sir George Calvert, afterward Lord Baltimore, and here in 1638 Sir David Kirke held the court of a count palatine with powers over the whole island. Ruins of the ancient fort exist. Its development was arrested by troubles with the French. Pop., 1901, 535.

FERSEN, fĕr′sen, Fredrik Axel von (1719–94). A Swedish soldier and statesman, born at Stockholm and descended from the Scottish McPhersons. He served in the French army from 1740 to 1748 and was promoted to the rank of major general. As a lieutenant general of Sweden he served in the Seven Years' War and conquered the islands of Usedom and Wollin. In 1770 he became field marshal. Thereafter he was an important factor in the politics of Sweden, especially as a leader of the "Hats," until, as the centre of the opposition of the nobles to Gustavus III, he was apprehended in the Riksdag of 1789 and compelled to retire from politics. He was a member of the Swedish Academy founded in 1768. His *Historiska Skrifter* (Stockholm, 1867–72), largely autobiographical, are interesting, but not always unbiased.

FERSEN, Hans Axel, Count (1755–1810). A marshal of Sweden and the son of the preceding. He studied at the Turin military academy, and, after serving in the Swedish army, became colonel of the regiment called Royal Suédois at the court of Louis XVI, where he was a conspicuous figure in the social life and a favorite of the Queen. From 1780 to 1783 he served with Rochambeau in America. Out of devotion for Marie Antoinette, he accompanied the royal family in their flight to Varennes and labored for their welfare after their capture, even to the extent of risking his own safety in returning to Paris to plan their escape from prison. Returning to Sweden in 1793, he was made marshal, chancellor of the University of Upsala, and was sent as plenipotentiary to the Congress of Rastadt. When the Crown Prince of Sweden died suddenly in June, 1810, the people, who hated Fersen, accused him of having poisoned the Prince and, seizing him in the town hall, to which he had been taken, murdered him (June 20, 1810). His complete innocence was subsequently established. Consult: Klinckowström, *Le comte de Fersen et la cour de France* (Paris, 1877); Graudat, *Un ami de la reine* (ib., 1892); Fach, *Grefre Hans Axel von Fersen* (Stockholm, 1896).

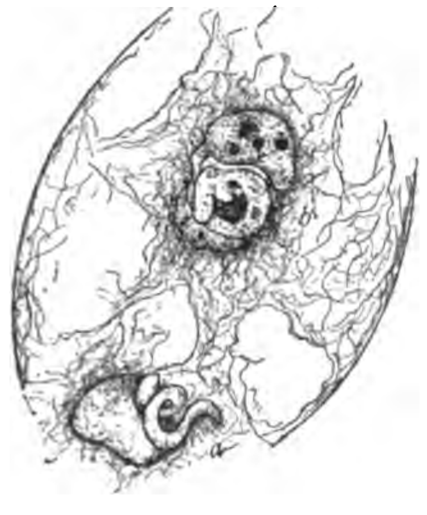
FER′TILIZA′TION (from Lat. *fertilis*, fertile, from *ferre*, to bear, Gk. *φέρειν*, *pherein*, Skt. *bhar*, Goth. *bairan*, OHG., AS. *beran*, Eng. *bear*). In plants, the fusion of two sexual cells, or gametes (q.v.). This process, sometimes called "fecundation," is exhibited in the life histories of most plants. Gametes are present in all plants, excepting the lower forms. The possible derivation of gametes has been suggested by the life histories of certain algæ, as *Ulothrix*, in which there is an evident relationship between gametes and the ordinary asexual swimming spores. It is probable that gametes have in general been derived from asexual spores, and it is not surprising that they occasionally germinate as asexual spores. In the simplest cases of fertilization the gametes are similar, so that there is no apparent distinction of sex. In this case the process is often called "conjugation," and plants which exhibit it are known as "isogamous" plants. Almost all plants, however, are "heterogamous"; i.e., the pairing gametes have become so different that a distinction of sex is plainly evident. In heterogamous plants the male gamete is known as the "sperm," and the female gamete as the "egg," and fertilization in its restricted sense is the fusion of sperm and egg. Along with the differentiation of gametes has occurred the differentiation of sex organs (gametangia), those developing sperms being called "antheridia," those developing eggs being called "oögonia," or "archegonia." The result of fertilization is the formation of a spore which is in all plants technically the "oöspore," or fertilized egg. To distinguish the result of conjugation from that of ordinary fertilization, the name "zygospore" is commonly substituted for "oöspore." Among seed plants a single free egg is developed within the embryo sac, and within the pollen grain certain cells are developed which are called "male cells," and which are sperms in function.



FERTILIZATION.

1, sex organs of *Vaucheria;* 2, conjugation of two ciliated gametes; 3, a large egg surrounded by numerous sperms; 4, antheridial tube entering egg of Cystopus; 5, sperms entering archegonium of a liverwort.

One of the chief features in connection with the process of fertilization is the method by which the pairing gametes are brought together. In conjugation the two gametes have similar powers, and in the majority of cases are motile bodies, usually swimming by means of cilia. In some cases in the lower forms the gametes are brought together by the development of a tube which bridges the space between the sex organs. In heterogamous plants the sperm is always the active gamete and finds its way to the egg, which remains quiescent. Among the higher algæ, mosses, and ferns the sperm is, as a rule, a free-swimming ciliated cell, and is attracted to the oögonium, or archegonium, by various chemical substances which are secreted in connection with the female sex organ. One of the distinguishing marks of the seed plants, however, is that the sperm ceases to be a motile body and is ordinarily transferred from the pollen grain in which it is produced to the egg by means of a tube called the "pollen tube." This tube in gymnosperms (pines, etc.) penetrates the tissues of the ovule lying above the embryo sac, and in the angio-sperms (flowering plants) it passes through the style, enters the ovary, and finds its way to the ovule. It is an interesting fact that in the Cycadales (q.v.) and Ginkgoales (q.v.) ciliated sperms have been discovered, which indicates that the old free-swimming habit of the sperm had not been entirely abandoned with the introduction of pollen tubes. In fact, all of the ancient gymnosperms are known now to have had swimming sperms.



DOUBLE FERTILIZATION IN LILY.

a, fusion of sperm and egg; *b*, fusion of sperm with two polar nuclei.

While the passage of the sperm to the egg may be included under fertilization, the real act of fertilization consists in the fusion of the two naked cells. Just what happens in this fusion may be illustrated by the process of fertilization in the seed plants. Each gamete is a naked cell consisting of a nucleus about which there is organized cytoplasm. In the sperm the nucleus is very prominent and the cytoplasm relatively scanty. In the egg the nucleus is also prominent, but the cytoplasm is abundant and contains a rich supply of food reserve. In the seed plants it has been observed that the pollen tube approaches the egg and discharges a male cell into the cytoplasm. The nucleus of the male cell then slips out of its cytoplasm as out of a sheath and moves through the cytoplasm of the egg towards its nucleus. The male cytoplasm has thus been left behind in the egg cytoplasm, and it is not clear that the fusion of the two holds any important relation to the act of fertilization. In any event, the most evident fact in fertilization is the approach of the male nucleus to the female nucleus, and the fusion of the two. Just what this fusion involves, and how complete it is, is not clear. The nuclei are exceedingly complex structures, and just how far the corresponding structures of the two nuclei fuse in this process is very uncertain. In certain seed plants, as in gymnosperms, it has been observed that the two sets of chromosomes, which are thus brought together by the fusion of the two nuclei, do not fuse for some time and in some cases for several cell generations. It is evident, therefore, that the fusion does not necessarily involve a fusion of the chromosomes of the nuclei, which are regarded as probably the essential structures. The whole subject remains somewhat vague as to details, but the general fact that fertilization involves the fusion of two cells, and that in this fusion the two cytoplasms and the two nuclei take part, is well made out. The significance of the male cytoplasm, whether it simply acts as a carrier of the nucleus or is an essential feature in the fusion, and the details of nuclear fusion, whether it is a complete pairing of all of the structures which belong to the nuclei or not, are questions which investigation has not yet settled. See Cell; Gametes; and articles on the various groups of plants mentioned above.

FERTILIZATION OF FLOWERS BY INSECTS. See Cross-Fertilization; Flowers and Insects; Pollination.

FERTILIZERS. In agriculture, a generic term for substances added to soil to increase the growth of crops. In its more restricted sense it embraces only such materials as have passed through some process of manufacture and are known as commercial fertilizers. These include many inorganic materials, such as potassium sulphate and chloride, ammonium sulphate, sodium nitrate, phosphatic rock in various prepared forms, and also many organic substances, such as ground bone, fish, tankage, ground-oil cakes, etc. For more detailed treatment, see Manures and Manuring.

FER'UMBRAS, Sir. The hero of an English translation of *Fierabras*. See Fierabras.

FESCENNIA, or **FESCENNIAN.** See Fescennine Verses.

FES'CENNINE VERSES (Lat. *Fescennini* [*versus*], or *Fescennina*). A branch of the indigenous poetry of ancient Italy. They were dialogues in rude extempore verses, generally in Saturnian measure, in which the participants rallied and ridiculed one another. They formed a favorite amusement of the country people on festive occasions, especially at the conclusion of harvest and at weddings or at triumphs. As was to be expected, they often degenerated into licentiousness, that at last required the curb of the law. The Fescennine verses are usually considered to have been of Etruscan origin and to have derived their name from the Etrurian town Fescennium (Fescennia). The name may, however, be connected rather with *fascinum*, fascination, enchantment, or the evil eye, against which the chanting of verses may have originally been intended as a protection. The Fescennine verses, in sophisticated form, were long written, as, e.g., by Catullus, lxi, 120 ff. (Consult Ellis's notes there.) Such Fescennines, too, were written by Claudianus (q.v.). Consult Schanz, *Geschichte der römischen Litteratur*, vol. i, § 9 (3d ed., Munich, 1907), and Knapp, *American Journal of Philology*, xxxiii, 146–148 (New York, 1912). See Satire.

FESCH, fĕsh, Joseph (1763–1839). Cardinal Archbishop of Lyons and maternal uncle of Napoleon I, born at Ajaccio, Corsica. He was destined from the first for the church and received a careful education in the seminary at Aix, becoming a priest shortly before 1789. During the Revolution, however, Fesch served as commissary of war under his illustrious nephew, in Italy, up to 1799. On the inauguration of the Consulate Fesch resumed his clerical habit, and was instrumental in bringing about the Concordat of 1801 with Pius VII. As a result of his activity, he was made Archbishop of Lyons the year following and in 1803 received the Cardinal's hat. In 1804 he successfully negotiated the matter of the consecration of the Emperor by the Pope at Paris and assisted at the coronation in Notre Dame. As a reward for the success of this difficult negotiation, he was made Grand Almoner of France, was granted the grand cordon of the Legion of Honor, and appointed member of the Senate. In 1806 Fesch was appointed, by Dalberg, Prince Primate of the Confederation of the Rhine, as his coadjutor and successor. In 1809 he declined the archbishopric of Paris, and soon showed himself an opponent of Napoleon's policy with regard to the papacy. Finally, in 1810, at the French ecclesiastical council at Paris he stood out in open opposition to the Emperor. Sent in disfavor to his diocese, Fesch attempted to communicate with Pius VII, but his letter was discovered, and he fell into open disgrace. In 1814 Fesch retired to Lyons, but reappeared during the Hundred Days, returned to his diocese, and was made a member of the House of Peers by Napoleon. Banished by the Bourbons, he retired to Rome in 1815 and passed the rest of his life in luxurious retirement, leaving his diocese to be administered by a vicar. He died in Rome, May 13, 1839. Consult his "Correspondance," in Du Casse, *Histoire des négociations diplomatiques* (Paris, 1855); Lyonnet, *Le cardinal Fesch* (Lyons, 1841); Ricard, *Le cardinal Fesch* (Paris, 1893); Welschinges, *Le pape et l'empéreur* (ib., 1905).

FES'CUE (corrupt. of *festu*, OFr. *festu*, Lat. *festuca*, straw, stalk), *Festuca*. A genus of grasses, very nearly allied to brome grass (q.v.). The species are numerous and are very widely diffused over the world, both in the Northern and Southern hemispheres. Among them are many of the most valuable pasture and fodder grasses. Tall or meadow fescue (*Festuca elatior*), a species from 2 to 4 feet tall, common in moist meadows and pastures of rich soil in Great Britain and throughout Europe, in northern Asia, and in some parts of North America, is perhaps excelled by no meadow or pasture grass whatever. It is suitable both for meadows and for permanent pasture. *Festuca pratensis*, by many botanists regarded as a variety of meadow fescue, is an excellent grass for rich moist meadows. Hard fescue (*Festuca duriuscula*, sometimes classed as a variety of *Festuca ovina*), known by various other synonymous names, a grass from 1½ to 2 feet tall, with a somewhat contracted panicle, mostly on one side, is well adapted for lawns and sheep pastures, particularly on dry or sandy soils. Several varieties are known to seedsmen and farmers. Creeping fescue, or red fescue (*Festuca rubra*), is distinguished chiefly by its extensively creeping root, which particularly adapts it to sandy pastures and to places liable to occasional inundations. It has many recognized varieties. Sheep's fescue (*Festuca ovina*) is a smaller grass than any of these, not generally exceeding a foot in height and often much less, abundant in mountainous pastures and especially suitable for such situations, in which it often forms a principal part of the food of sheep for many months of the year. It is common in all the mountainous parts of Europe and in the Himalayas and is also a native of North America. Species very similar to this, if not mere varieties of it, abound in the Southern Hemisphere. Its habit of growth is much tufted. Of species which have been introduced into cultivation in the United States and Great Britain, *Festuca heterophylla*, referred by some authors to various other specific names, deserves notice. It is a tall species with narrow root leaves and broad leaves on the culm. It is a native of France and other parts of the continent of Europe and is pretty extensively cultivated in some countries, particularly the Netherlands. A number of species abound in the western United States, where they are important constituents in the range pastures. All these species are perennial. Some small annual species occasionally form a considerable part of the pasture in dry, sandy soils, but are never sown by the farmer. A Peruvian species, *Festuca quadridentata*, called "pigouil" in its native country and there used for thatch, is said to be poisonous to cattle.

FESS (OF. *fesse*, Fr. *faisse*, *fasce*, *fesse*, from Lat. *fascia*, bundle). In heraldry (q.v.), one of the charges known as ordinaries. See Plate of HERALDRY.

FES′SENDEN, REGINALD AUBREY (1866–). An American electrician, born at Milton, Quebec Province, Canada. From 1887 to 1890 he was head chemist of the laboratory of Thomas A. Edison, the inventor; from 1890 to 1892 an electrician with the Westinghouse Company of Newark, N. J., and in 1892–93 professor of physics and electrical engineering in Purdue University (Lafayette, Ind.). In 1893–1900 he was professor of electrical engineering in the Western University of Pennsylvania (Allegheny, Pa.). From 1900 to Aug. 31, 1902, he was a special agent of the United States Weather Bureau, in charge of investigations in wireless telegraphy as an aid to the collection of daily weather reports.

FES′SENDEN, THOMAS GREEN (1771–1837). An American writer. He was born at Walpole, N. H., and graduated at Dartmouth in 1796. He was for some time in London engaged in an enterprise which ruined him financially, and while there advertised the metallic tractors of Benjamin D. Perkins (q.v.) in a grotesque poem entitled *Terrible Tractoration* (1803), a satire upon the medical profession which opposed the use of the instruments. In 1822 he started in Boston the *New England Farmer*, with which he was connected until his death. For two years he was editor of the *Weekly Inspector* in New York City. Among his further works are: *Pills, Poetical, Political, and Philosophical, Prescribed for the Purpose of Purging the Public of Piddling Philosophers, Penny Poetasters, of Paltry Politicians, and Petty Partisans, by Peter Pepperbox, Poet and Physician* (1809); *Democracy Unveiled* (1806); *The Complete Farmer and Rural Economist* (1834; 4th ed., 1839); *The American Kitchen Gardener* (1856). Consult Hawthorne, *Fanshawe, and Other Pieces* (Boston, 1876).

FESSENDEN, WILLIAM PITT (1806–69). An American statesman. He was born in Boscawen, N. H., graduated at Bowdoin College in 1823, and began the practice of law in 1827. He settled in Portland, Me., was elected to the State Legislature in 1832, and became known as an able debater. From 1840 to 1843 he served in the national House of Representatives as a Whig. At the end of this term he devoted himself to the practice of law, winning national repute in his profession and as an antislavery Whig orator and campaign speaker. In 1848 he was a strong supporter of Webster for the presidency. In 1854, while a member of the Maine Legislature, he was elected United States Senator by the combined votes of the Whig and antislavery Democratic members. A fortnight after taking his seat in the Senate, he delivered a stirring speech in opposition to the Kansas-Nebraska Bill, thereby leaping at once into prominence as one of the ablest speakers on the antislavery side. In 1859 he was reëlected to the Senate for a second term as a Republican and was at once made chairman of the important committee on finance, in which position during the next five years he ably seconded President Lincoln and Secretary Chase in their attempts to solve the puzzling financial questions arising from the war. Upon the resignation of Secretary Chase in 1864, President Lincoln and his counselors turned to Senator Fessenden as the man best fitted to take the vacant portfolio of the Treasury. Fessenden hesitated at first, but after it became evident that there was need of his services and that both President and nation looked to him in the emergency, he accepted. The period was one of the blackest in the financial history of the country. Gold was at 280, the currency of the nation was inflated, the paper dollar was worth only 34 cents, and the government had just found it necessary to withdraw from the market a loan which it had been unable to float. The first act of the new Secretary in this crisis was the issuance of the famous "seven-thirty" bonds—bonds bearing interest at the rate of 7.30 per cent and issued in denominations as small as $50. His idea was that, if appeals were made to the patriotism of the people, and the loan offered in such sums that people of moderate means could invest, it would succeed, and his judgment proved correct. He also withheld the further issue of greenbacks for the time being, thus inducing the State banks to adopt the national system. Gold having fallen to 199 and the necessities of the occasion having been met, Secretary Fessenden resigned his portfolio in March, 1865, in order to take his seat in the Senate, to which he had been chosen for a third term. In the years immediately following the war he took a leading part in the debates and was chairman of the joint committee on reconstruction. His action in voting for the acquittal of President Johnson on his impeachment trial brought upon him the harshest criticism of his political career. He faced bravely the storm of reproach which it called forth, and although for the moment his political associates looked upon him as almost a traitor, his sincerity and honesty of purpose were so apparent, and his continued devotion to the principles of the Republican party so absolute, that he very soon won again his old position as a party leader. Consult Francis Fessenden, *Life and Public Service of W. P. Fessenden* (2 vols., Boston, 1907).

FESSLER, fĕs′lĕr, IGNAZ AURELIUS (1756–1839). A well-known Hungarian historian and ecclesiastic. He was born at Czurendorf and educated at Pressburg and Raab. He was successively a Capuchin monk in Vienna, professor of hermeneutics at Lemberg, a Protestant and Freemason at Berlin, a lecturer on philosophy at St. Petersburg, a government official at Saratov, and, lastly, general superintendent of the Lutheran Community of St. Petersburg. His departure from Austria was due to persecution at the hands of the church for having denounced the monks to Joseph II. He wrote several historical novels (*Marc Aurel, Matthias Corvinus, Attila*) now well-nigh forgotten; a historical work, *Die Geschichte der Ungarn und deren Landsassen* (10 vols., Leipzig, 1815–25); and a curious autobiographical sketch, *Rückblicke auf meine Siebzigjährige Pilgerschaft* (Breslau, 1824). He died at St. Petersburg, Dec. 15, 1839.

FESS′LER, JOSEPH (1813–72). An Austrian Roman Catholic theologian, born at Lochau in the Crownland of Vorarlberg, of a peasant family. He studied at Innsbruck and the Seminary of Brixen, was ordained priest in 1837, in 1841 was appointed instructor in Church history at Brixen and in 1843 in canon law also. He was elected to the Frankfort Parliament in 1848, received appointment to the chair of Church history at Vienna in 1852, and was transferred to that of canon law in 1856. In 1861–62 he was a member of the Congregation for the Oriental Rites at Rome; he became in 1864 Bishop of St. Pölten and in 1869 general secretary of the Vatican Council. His most important work is his *Institutiones Patrologiæ* (1850–51; new ed. by Jungmann, 1890–96). He also wrote a *Geschichte der Kirche Christi* (4th ed., 1877), and on the infallibility of the Pope, *Die wahre und die falsche Unfehlbarkeit der Päpste* (1871), a reply to Schulte's *Das vaticanische Concilium*, in which Fessler holds, like Newman, that papal infallibility is confined to cases in which the pontiff exercises the prerogative. Consult the biography by Erdinger (Brixen, 1874).

FES'TA, CONSTANZO (c.1490–1545). An Italian singer and composer, celebrated as the forerunner of Palestrina. He was born probably in Rome, where in 1517 he entered the pontifical chapel as a singer and contrapuntist. He was very soon appointed maestro in the Vatican and retained his position until his death. Only a few of his numerous masses, motets, madrigals, and litanies have been printed. His *Te Deum*, published in Rome in 1596, is a composition of remarkable beauty and is still sung at the Vatican at Corpus Christi and on other solemn occasions. Several of the works of Festa are preserved in the archives of the Vatican and in the collections published by Giardane and Scotto (sixteenth century). Festa is generally regarded as the first great composer of the Roman school.

FES'TE. Olivia's clown in Shakespeare's *Twelfth Night*. He joins in the plot against Malvolio, and some of the author's best lyrics are sung by him.

FESTIN DE PIERRE, fĕs'tăɴ' de pyâr'. See DON JUAN.

FESTIN'IOG. A town and railway junction in Merionethshire, Wales, 8½ miles east-northeast of Portmadoc (Map: Wales, C 4). It is situated amid picturesque mountain scenery and is noted for its slate quarries, which give employment to most of its inhabitants. Pop., 1901, 11,400; 1911, 9689.

FES'TIVAL PLAYS. See MYSTERIES.

FES'TIVALS (OF., Fr. *festival*, from ML. *festivalis*, from Lat. *festivus*, festive, from *festum*, feast), or FEASTS. Days or seasons set apart for public rejoicing and rest from ordinary labor, at stated intervals, or occasionally for religious purposes solely, or for the celebration of some person or event. Originally all festivals were of a religious character, since eating, drinking, and other pleasures connected with them could not be indulged without sharing these enjoyments with the divinities. The earliest of all festivals seem to have been connected with the cult of the dead. At great banquets communion was held with the departed spirits, and offerings were made to them. As clans grew and became scattered, such common meals could only be arranged occasionally. When the great luminaries began to attract worship and the ancestral spirits were in some way connected with them, these banquets were held annually or monthly. While purely animistic festivals are still observed in different parts of the world, when food and drink are offered to the dead at their burial places, in the vast majority of instances the primitive significance has been obscured or wholly obliterated by a superinduced reference to natural phenomena or historic events. Wandering tribes are greatly attracted by the changing phases of the moon, and the festivals characteristic of the nomadic state are chiefly lunar. When men settle down to agricultural life, they become dependent on sunshine and rain; winter and summer, seedtime and harvest, equinoxes and solstices, become the occasions for festivities. With the development of a more complex social organization and the rise of great empires, the interest in national self-preservation becomes acute, and the feasts assume a political character as celebrations of deliverance and victory. Veneration of the great religious leaders who have deeply impressed a people's life, leads to the setting apart of certain days in their honor. But whatever new significance is added to an earlier festival, something of its old character is likely to adhere to it. The god who sleeps during the winter and is awakened from his slumber at the vernal equinox has much in common with the ancestral spirit to whom new vitality is given by a libation of blood, and it is natural that the celebration of those mighty beings whose changing fortunes and all too human experiences were seen portrayed in the ceaseless play of nature's forces, should borrow a feature from the banquets in honor of the departed dead. Fellowship with and likeness to the spirits associated with the elements of nature are sought in more exacting cultic performances. In solemn mimicry and self-inflicted pains the acts and sufferings of the deity are imitated. Sympathy with the solar divinity as well as with his mother and his spouse in the loss of generative power and the recovery of reproductive strength is expressed by the worshiper in self-imposed impotence and sterility or unrestrained sexual abandonment. Songs, shouts, dances, and processions, simple scenic representations, and ultimately the drama are the results of such symbolic actions. When historic personalities and events begin to be celebrated, the character of the gods is apt to be transferred to the heroes, and the divine experiences blend with the human. This is especially the case with the great religious leaders, whose apotheosis is most natural.

The festivals celebrated by the ancient Toltecs and Aztecs of Mexico, and the Incas of Peru, while retaining features of ancestor worship, were for the most part of a solar and lunar character. The Mexicans had their chief feasts in May, June, and December. The Peruvians, besides the new moons, also celebrated the summer and winter solstices and the equinoxes. The Chinese have a very elaborate system of festivals. Of these the most important is the one celebrated in honor of the dead at the winter solstice. Even the Buddhists of China have their feasts commemorating the birth of Gautama Buddha, his departure from home, and his entrance into Nirvana. The Karens have an annual feast in honor of the departed, while the Nagas of Assam make their offerings to the dead each moon. In Siam the 8th and 15th of every month are considered sacred. From the Yajur-Veda period to the present day numerous feasts have been observed in India. The Hali at the vernal equinox and the Dasahara in the autumn are mentioned as early as Aitareya Brahmana. In honor of Vishnu, Siva, and Indra, the Ganges, and the goddess Kali, festivals are still held. The ancient Persians had four solar feasts, at the solstices and the equinoxes, an annual funeral feast in February, a celebration of the five intercalary days, and several festivals to which a historic significance was given, as celebrations of victories like that of Iran over Turan and of Feridun over Zahak. The Fravardigan, or New Year's Feast, had distinctly animistic features. With the Mithra cult its great feast on the 25th of December passed to Asia Minor and the West. The Asianic peoples seem to have had their festivals at the equinoxes. Thus, the Phrygians celebrated the sleep and the awakening of the sun god in the fall and the spring. The intense worship of the mother goddess in Asia Minor no doubt influenced profoundly the festivals of the Ionian Greeks.

In Greece each demos had its peculiar calendar. But the *ἑορτή*, or new-moon feast (*Odyssey*, xx, 156), was probably kept very generally in earlier times. A harvest festival, and an ancestral feast in honor of Erechtheus also go back to a high antiquity (*Iliad*, ix, 533; ii, 550). The Athenian calendar which is best known contains one or more festivals each month. In January the *Lenæa*, or wine-press feast, in honor of Dionysus was celebrated (see BACCHUS); in February, the *Anthesteria* of Dionysus, the *Diasia* of Zeus, and the lesser *Eleusinia* (see ELEUSINIAN MYSTERIES); in March, the *Pandia* of Zeus, the *Elaphebolia* of Artemis, and the greater *Dionysia;* in April, the *Munychia* of Artemis and the *Delphinia* of Apollo; in May, the *Thargelia* of Apollo and the *Plynteria* and *Callynteria* of Athene; in June, the *Diipolia* of Zeus and the *Scirophoria* of Athene; in July, the *Cronia* of Cronus and the *Panathenæa* (q.v.) of Athene; in August, the *Metageitnia* of Apollo; in September, the *Boëdromia* of Apollo, the *Nemesia*, and the greater *Eleusinia;* in October, the *Pyanepsia* of Apollo, the *Oschophoria* of Dionysus, the *Athenæa* of Athene, the *Thesmophoria* of Demeter, and the *Apaturia;* in November, the *Maimakteria* of Zeus; and in December, the lesser *Dionysia*. The *Nemesia* was an ancestor feast; historic associations clustered about other festivals, while still others were nature feasts. Great significance was acquired by the national feasts, of which the games and dramatic performances became the leading attractions. See ISTHMUS; NEMEA; OLYMPIA; OLYMPIAD; OLYMPIC GAMES; PYTHIAN GAMES.

As in Greece, so in Italy, the festivals were in earlier times comparatively few in number. Among them were distinctly animistic feasts, such as the *Lemuralia* and the *Feralia*. The Roman receptivity to foreign religious customs subsequently led to a great increase and a constant fluctuation in their number. At the beginning of the Christian era the most important were the following: In January, New Year's Day, the *Agonalia* and the *Carmentalia;* in February, the *Faunalia*, the *Lupercalia*, the *Quirinalia*, the *Feralia*, the *Terminalia*, the *Fugalia*, and the *Equiria;* in March, the *Matronalia*, the *Liberalia*, and the *Quinquatria;* in April, the *Megalesia*, the *Cerealia*, the *Palilia*, the *Vinalia*, the *Robigalia*, and the *Floralia;* in May, the *Lemuria* and the *Ludi Martiales;* in June, the feast of *Semo Sancus*, the *Vestalia*, and the *Matralia;* in July, the *Apollinaris* and *Neptunalia;* in August, the *Nemoralia*, the *Consualia*, the *Vinalia Rustica*, and the *Vulcanalia;* in September, the *Ludi Magni* in honor of Jupiter, Juno, and Minerva; in October, the *Meditrinalia*, the *Faunalia*, and the *Equiria;* in November, the *Epulum Jovis;* and in December, the last *Faunalia*, the *Opalia*, the *Saturnalia*, and the *Larentalia*. Under the emperors the number of festivals increased to such an extent that at one time there were more feast days than days of work.

The Germanic nations had important festivals at the winter solstice and the vernal equinox, the Yuletide devoted to Frey, the Easter to the goddess Ostara, and there are also traces of neomenia. Evidence of original ancestor worship is found in connection with some Celtic and Slavonic feasts.

In ancient Egypt each nome had originally its own cycle of feasts, and the character of the festivities was determined by the nature of the divinity worshiped at its chief sanctuary. Lunar feasts in honor of the dead were apparently celebrated everywhere, and even the solar feasts were likely to be of an animistic character. Since the fertility of the soil depended wholly upon the inundations of the Nile, it is natural that its rising should be celebrated throughout the valley. Where worship of the solar deities forms so large a part of the religious life as in Egypt, and in the epic of the myths all other gods and departed spirits are brought into relation with them, it is natural that the life-producing energy of the sun should be bodied forth in symbolic acts. Sexual excesses were therefore apt to characterize especially the celebration of the great goddesses Neith, Nut, Hathor, and Isis. In later times, however, a pantheistic philosophy and a mystic mood seem to have given the Isis festivals a more spiritual character.

In Babylonia each great sanctuary also developed its own calendar. Extant inscriptions do not give a full account of any system; but it is evident that some of the greatest festivals, such as the Zakmuk, or New Year's feast at the vernal equinox, and the Sacæa possibly at the summer solstice, were kept throughout the land. At the former the destinies of men were fixed for the coming year. It seems to have been a Marduk festival. A procession between the neighboring shrines of Babylon and Borsippa took place at this time, and the King "seized the hands of Bel," by which ceremony he was formally installed as vicegerent of the god during the year. According to Berosus and Strabo the Sacæa had a Dionysiac character, and among the enjoyments it furnished was the crowning of a condemned criminal as mock king. For five days he had full license and then was disrobed, scourged, and impaled. The five days are probably the *humustu*, or intercalary days. At certain Ishtar feasts women sacrificed their virginity or offered themselves for the benefit of the goddess, according to Greek writers. A special significance seems to have been attached to the 7th, 14th, 19th, 21st, and 28th days of the month, according to an ancient calendar. The term *shabbatum* is explained in a lexical tablet as "day of the rest of the heart." It is therefore possible that the name of the Sabbath is of Babylonian origin as a day when the heart of the gods was pacified by sacrifice. But we now know that *shabbatum* in reality was the designation of the 15th day of the month and meant "full moon," and it is altogether probable that in earlier times *sabbath* meant "full moon" also in Israel. (Consult Jastrow, *Hebrew and Babylonian Traditions*, New York, 1914.) Whether it was observed by the ancient Canaanites and Phœnicians cannot be determined. (See Sabbath.) The clearest testimony concerning their festivals is found in the Hebrew records, since it was from these Semitic peoples that the invaders borrowed the agricultural festivals. The license that prevailed at the Ashtaroth and Adonis festivals is vouched for by many witnesses.

While South Arabian inscriptions are beginning to clear up the history of the peninsula before Mohammed (see Minæans; Sabæans), we are still dependent upon Islamic writers for our knowledge of the festivals that were kept in that period. In spite of their misapprehensions it is possible to discern the fact that the great festivals of the Muslim calendar are adaptations of pagan feasts, and even the manner of celebration is certainly a continuation of the old traditions. The great feast of ancient Arabia was in the spring, in the month called Rajab, during which, on account of this festival, cessation of hostilities between the tribes was ordained. This sacred season was originally fixed at the beginning of the summer, but the ignorance of astronomy in the earliest time, and the insistence upon a lunar year, caused the months to recede from year to year. At this time the firstlings were offered. Muharram was the first winter month, and its beginning marked the New Year with a festival at the autumnal equinox. The first 10 days of the month are considered sacred by the Shiites and observed in commemoration of the martyrdom of Husain. (See Mohammedan Sects; Hasan and Husain.) The 10th of the month is generally observed throughout the Muslim world. The birthday of the Prophet in the third month is kept, and the 27th of the seventh month in commemoration of his supposed miraculous ascent to heaven. The first three days of Shawual, the tenth month, constitute the "minor festival." It follows immediately upon the end of the fast of Ramadan (the ninth month) and is a time of general rejoicing after the rigors of this season. (See Ramadan.) On the 10th of Dhu'l Hijjah (the day of the sacrifice at Mecca; see Hajj) begins the "great festival," lasting three or four days. The departure and return of the pilgrimage are also occasions of ceremony and rejoicing. Many other days have a local observance in honor of some great man or event. The method of keeping a Mohammedan holiday varies greatly. Public processions are often a prominent feature. Friday (el-Jumah) is frequently called the Mohammedan Sunday. It is the great day for public gathering at the mosque, but has no other point of resemblance to the Christian holy day.

Before their invasion of Palestine the Hebrew tribes seem to have had one important annual festival, the Passover (q.v.). This *Pesach*, or leap feast, so called probably from the gamboling of the young, was celebrated about the time of the vernal equinox, apparently by each household offering the firstlings of its flocks and herds. The recipients of these sacrifices may have been the household gods (*Elohim*), as even after the settlement in Palestine, when the people lived in houses and no longer in tents, they seem to have smeared the blood upon the threshold and the doorposts, where these guardian spirits were conceived to have their abode. It is probable that the festival of the new moon was also celebrated in this period; and the Feast of Sheep-Shearing may be of equal antiquity (1 Sam. xxv. 2; 2 Sam. xiii. 23). When the different tribes had settled down to agriculture, they naturally learned of their new neighbors how to celebrate properly the harvest feasts, until then unknown to them. The great agricultural feasts were three in number. At the Feast of Unleavened Bread (called *Hag ham-mazzoth*, from *hag*, a dance, a pilgrimage, a festival, and *mazzoth*, cakes) the first fruits of the barley harvest were presented to the local Baal or to Yahwe. Seven weeks later the Feast of Weeks was observed (*Hag shabu'oth*, or *Hag haq-qasir; shabu'oth*, weeks; *qasir*, harvest), when the wheat crop had been gathered in. The time between these two feasts was a single festive season. In the autumn the Feast of Tabernacles came (*Hag has-sukkoth*, or *Hag asiph; sukkoth*, booths, tents; *asiph*, gathering, harvest), "the ingathering at the year's end." This was on the occasion of the vintage and the olive gathering. Its name was derived from the custom of living in groves and gardens in huts made of boughs. These booths were the scene of much merriment. Sacred dances were an important feature. At Shiloh the young maidens performed choral dances in the vineyards (Judg. xxi. 19 et seq.). Eli's suspicion of Hannah shows how freely the wine was used even by women on these occasions (1 Sam. i. 14). The denunciations of the preëxilic prophets reveal the essentially Dionysiac and licentious character of these festivals at the great shrines. To such an extent were drunken orgies and sexual indulgences characteristic features of these feasts, that men like Amos and Hosea, Isaiah and Jeremiah, declared the sacrificial system and the temple cult contrary to the will of Yahwe. Concerning some early festivals our information is very scanty. Thus, the Jephthah festival in Gilead, at which a virgin apparently was sacrificed, may have been either in honor of a virgin goddess, or more probably of the divinity who opens the womb, in order to insure the fertility of the tribe (Judg. xi. 40). The centralization of the cult in Jerusalem and the attempted abolition of all sanctuaries outside of the capital in the reign of Josiah (637–608 B.C.) had a tendency at once to enhance the importance of the great festivals and to check the moral abuses associated with the rural feasts. But the destruction of Jerusalem and the end of the independent statehood of Judah naturally caused a revival of the local cults. That even some of the features most vehemently denounced by the prophets still continued in the fifth and fourth centuries B.C. is evident from Isa. lvi–lxvi. Having no temples, the exiles naturally put the more emphasis upon the keeping of the Sabbath, which was possible even in a foreign land. This had now ceased to be connected with the phases of the moon and fell on every seventh day. It is significant that the insistence upon reform in the observance of the Sabbath was first made in Jerusalem by men born in Persia, such as Nehemiah and Ezra. All festivals are in this period given a historic significance. The ecclesiastical legislation did not recognize them as nature feasts, but as celebrations of Israel's deliverance from

Egypt. New feasts appeared in the *Rosh hash-shanah*, or New Year's Day, and the *Yom Kippur*, or the Day of Atonement, on the 1st and 10th of the seventh month respectively. In the Maccabæan period the Dedication Feast was introduced to celebrate the reconsecration of the temple of Yahwe, on the 25th of Chislev, 165 B.C., after it had been for three years a sanctuary to Zeus Olympius (1 Macc. iv. 59). It is not likely to be an accident, however, that this event was celebrated at the time of the winter solstice. The recovery of the temple about that time of the year rendered it possible to dedicate to Yahwe a festival widely celebrated by pagan neighbors and probably also by emancipated Jews. Similarly the feast of Nicanor on the 13th of Adar, in celebration of the victory of Judas Maccabæus at Beth-horon in 161 B.C., was apparently an adaptation of an earlier festival in honor of the dead (1 Macc. vii. 49; 2 Macc. xv. 36). Subsequently the Purim feast absorbed this Nicanor festival. The former seems to have been originally an Ishtar feast, celebrating the victory of this goddess and Marduk over the Elamitish divinity, Humba, conceived as a demon representing the nether world. In the Hebrew story told to commend the festival the names of the combatants in the Babylonian myth have been thinly disguised as Esther, Mordecai, and Haman, while in the actual celebration the ornamenting of the graves is most unimpeachable testimony to the worship of the dead once connected with it. As the Greek translation, according to the colophon, appears to have been made and brought to Egypt to introduce the Purim feast for the first time among the Jews living there in the year 45 B.C., the Book of Esther and the institution of the festival among orthodox Jews in Palestine cannot have been much older. Whether the feast of the capture of the Akra (1 Macc. xiii. 50–52), no longer celebrated in the time of Josephus, likewise grew out of a nature festival cannot be determined. Equally unknown is the origin of the Feast of Wood-Bringing (Josephus, *Bel. Jud.* ii, 17, 6) and of the Feast of the Rejoicing of the Law.

The attitude of Jesus to the feasts of His people seems to have resembled that of the earlier prophets. Concerning one of them only, the Sabbath, has His opinion been recorded. But His defense of His disciples when charged with breaking the Sabbath clearly reveals His position. "Man was not made for the sake of the Sabbath, but the Sabbath for the sake of man; therefore man has also authority over the Sabbath," is an assertion utterly at variance with the prevailing estimate of the day. Whether His last meal with His disciples was the paschal meal cannot be determined with certainty. These disciples no doubt continued to keep the Jewish festivals. Only as Christianity began to make converts outside of Judaism did the question of their observance become an important one. In the Epistle to the Galatians, Sabbaths, new moons, and other sacred days are regarded as shadows of the coming reality, and done away with in Christ, and the insistence upon Sabbath keeping is looked upon as a sign of apostasy from the liberty of the gospel. In the profound philosophy of the Fourth Gospel the festivals of the Jews find a symbolic interpretation. In Jewish-Christian circles, however, the Sabbath continued to be observed, as the *Apostolical Constitutions* and the canons of the Council of Laodicea show. A second-century gospel fragment in Coptic indicates that even the Jewish Passover was kept by Christians in Egypt. But gradually a number of Christian festivals came into vogue. It is not known how early the first day of the week began to be celebrated in honor of the resurrection. There is no trace of such an observance in the New Testament. For neither 1 Cor. xvi. 2, where each person is bidden to lay by him, i.e., in his own house, as he is prospered, on the first day of the week; nor Acts xx. 7, where there is a breaking of bread on the last day of Paul's stay in Troas, as probably on the preceding ones; nor Rev. i. 10, where the Lord's Day may refer to the great judgment day, can be quoted as showing that the first day was distinguished from other days as having a sacred character. What day Pliny refers to in his letter to Trajan is uncertain. In Barnabas xv. 9 some kind of celebration may be implied in the words "therefore we rejoice in the eighth day on which Jesus rose from the dead and having shown himself ascended to heaven." The first evidence of religious services upon the first day, because on it "God made the world and Jesus Christ rose from the dead," is found in Justin Martyr's *Apology*, written in 150 A.D. Whether the "venerable day of the sun" was first associated with the resurrection through the Mithra cult cannot yet be determined; but Constantine's decree, by which it was made a holiday for the Roman Empire, is couched in language that presupposes its general recognition as a sacred day. (See SABBATH; SUNDAY.) Through the Quartodeciman struggle a separate Christian festival distinct from the Passover developed in the second century, even though the Easter ritual preserved many features of the Jewish festival. (See EASTER.) While Origen still speaks of Pentecost as the whole season of seven weeks following Easter, the celebration of the outpouring of the Spirit was in course of time placed at the end of this period. Clement of Alexandria is the first to mention the festival of the Epiphany. That of the Nativity was later. Both Jews and other nations were accustomed to celebrate the winter solstice. Christmas may therefore go back either to the Dedication Feast, to the Roman Saturnalia, or to the great winter festival of the Mithra cult. Subsequently it united with the Germanic Yule. The feast of the Ascension is not older than the fourth century. The great number of pagans entering the church at that time, and the new character of Christianity as a state religion, caused many combinations of old festivals with the new ones. In the beginning of the sixth century attendance at church was made obligatory at Easter, Christmas, Epiphany, Ascension, Pentecost, Nativity, and St. John, and later Annunciation, Purification, Assumption of the Virgin, Circumcision, Michael, and All Saints were added. Soon after, the ecclesiastical year was arranged in three cycles: Advent, Easter, and Pentecost. The process of assimilating pagan festivals still continued. According to the direction of Gregory the Great, feasts as well as temples were to be appropriated. Thus, the Yule of the Germanic peoples and the Holiada of the Slavs were merged into Christmas, the feast in honor of the goddess Ostara united with the Passover, the Slavonic Kupulo feast blended with the midsummer festival in honor of St. John the Baptist, and the Celtic carnival and Brandon feasts continued under the Christian régime. The Greek church multiplied festivals in honor of the saints even faster than the Roman church. It instituted the special day for the celebration of all the saints of the old law. The Coptic church adopted seven great festivals: Christmas, Epiphany, Annunciation, Palm Sunday, Easter, Ascension, Pentecost. Towards the end of the Middle Ages earnest protests were made by leaders in the church as well as by dissenters against the increase of festal days, both for economic and religious reasons. The partial or complete cessation of work took a disproportionate amount of time from every form of labor, and in spite of religious observances and prohibition of certain amusements, the leisure and gayety of these days naturally had a tendency to lead to excesses of different kinds.

The modern tendency in the Roman Catholic church has accordingly been to reduce the number of holidays of obligation, ie., those on which servile work is prohibited; not counting Sundays, there are only six in the year in the United States. On the other hand, there has been a great increase in the total number of festivals, with the development of certain devotions and the gradual enlargement of the calendar. They are divided ritually into doubles, semidoubles, and simples, the first being those in which the antiphons at lauds and vespers are doubled, and including doubles of the first and second class, greater and lesser doubles. Doubles of the first class are frequently accompanied by octaves, i.e., the seven days after the feast are kept with corresponding ritual observances.

The only feast day retained by all the churches of the Reformation was Sunday (q.v.). The Church of England made fewer changes in the calendar than any other, retaining in addition to Easter, Christmas, Ascension, and Whitsunday, Trinity Sunday, the Circumcision, the Epiphany, the Purification and Annunciation of the Blessed Virgin, the Nativity of St. John the Baptist, All Saints, St. Michael, and All Angels, feasts of all the Apostles and Evangelists. Lutheran churches retained the feasts of the New Year, Epiphany, Annunciation, Palm Sunday, Easter, Ascension, Pentecost, St. John the Baptist, and Christmas. At Easter, Pentecost, and Christmas two days are kept. Presbyterians and other reformed bodies recognized no holy day, except Sunday, which is regarded as the Christian Sabbath. The Westminster Assembly of 1645 declared that there is no warrant in the Word of God for any other festival.

At the time of the French Revolution an attempt was made to reform the calendar by substituting a 10-day week for that of seven days, and the celebration of other events, personalities, and virtues for those emphasized by the church. But it had no permanent success. The separation of church and state in the United States, and the principle of religious liberty widely recognized in Europe, during the last century have raised many new questions concerning the sacred days. Where civil society can no longer take cognizance of the conceived sanctity of any day, but only guarantee that no citizen shall be disturbed at any time in his religious exercises, new grounds must be found for legislation affecting holidays. While absolute cessation from labor cannot be enjoined without infringing upon the liberties of the individual, the duty of society to protect its weaker members has been invoked to justify legislative measures securing to all the privilege of periodic rest. In some countries the public libraries, museums, art galleries, and theatres are open on holidays; in others, the labor necessarily involved is urged as the reason for prohibiting all educational and artistic exhibits. It is held by many sociologists that, as only a regularly recurring period of rest and recreation seems to be required, all legitimate needs may be met, without interruption of the world's work, its educational opportunities, and its artistic enjoyments, by an alternation of working forces.

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FESTOON' (Fr. *feston*, ML. *festo*, festal garland, from *festum*, feast). In architecture, a sculptured wreath or garland of flowers, leaves, or fruit, bound with fillets or ribbons, frequently used as an ornament in Roman and Renaissance buildings. It owes its origin to the practice of decorating the altars and the victims of festal sacrifices with such garlands and ribbons and was first used in permanent sculptured form on the altars, suspended from the *bucranes* (q.v.), and was later applied to the decoration of temples. The festoon occurs along with bulls' heads on the frieze of the temple of Vesta at Tivoli. The festoons are often represented, both in Roman and Renaissance art, as borne by infant figures, as on the tomb of Ilaria del Caretto by Giacopo della Quercia (q.v.), instead of animals' heads.

FESTU'CA. See FESCUE.

FES'TUS. A city in Jefferson Co., Mo., 30 miles southeast of St. Louis, on the Mississippi River, the Frisco Lines and the Mississippi River and Bonne Terre Railroad (Map: Missouri, F 3). Its industries are influenced by the large deposits of silica sand in the neighborhood, which is of an unusually pure variety. There are manufactories of plate glass and glass bottles. The electric-light plant is owned by the municipality. Pop., 1900, 1256; 1910, 2556.

FES'TUS. A dramatic poem by Philip James Bailey (1839).

FESTUS, Porcius. Procurator of Judea from 58 to 62 A.D., though as regards these dates, especially that of the appointment, there is considerable discussion. (See New Testament Chronology.) Festus succeeded Felix (q.v.) and was in turn succeeded by Albinus. His term of office was not marked by any events of note beyond (1) the settling by the Emperor against the Jews of the dispute between the Jewish and Syrian inhabitants of Cæsarea regarding their civic privileges—a dispute which had come over from the time of Felix, of whose removal from office, in fact, it had been the cause (see Felix); and (2) the controversy between Agrippa II and the priests in Jerusalem regarding the wall erected at the temple to break the view of the new wing of Agrippa's palace—a controversy in which Festus took the side of Agrippa, but which was appealed to Rome by the priests, Festus dying before the decision was known. In both these events, but especially in the former, Jewish hostility to Rome was greatly inflamed, and feelings were aroused which played an important part in the closely following Jewish War of 66 A.D.

It was before Festus that Paul, who had been left a prisoner by Felix, had his final hearing. On this occasion Festus, for the sake of pleasing the Jews, sought to induce Paul to go to Jerusalem for trial, in opposition to which suggestion the Apostle appealed to the Emperor. This appeal resulted in Paul's deportation to Rome in the autumn of 58 A.D. (Acts xxv–xxvi). See Paul.

FESTUS, Sextus Pompeius. A Latin lexicographer of the latter part of the second or third century of our era, and one of the most important ancient authorities we have on the Latin language. He made an epitome of the great work of Verrius Flaccus, *De Verborum Significatu*. This compilation, which was arranged alphabetically in 20 books, was still further abridged in the end of the eighth century by Paul, son of Warnefried, commonly called Paulus Diaconus (q.v.). The great work of Flaccus has unfortunately entirely perished, and of the abridgment made by Festus only a single manuscript, and that in a deplorably imperfect condition, has survived. It came from Illyria and fell into the hands of Pomponius Lætus, a distinguished scholar of the fifteenth century. It ultimately passed into the library of Cardinal Farnese at Parma and is now preserved at Naples. The work, in spite of all its imperfections, is a storehouse of knowledge on points of mythology, grammar, and antiquities. All previous editions of Festus were of little value compared with that of Müller (Leipzig, 1834; 2d ed., 1880), but this is now superseded by the later edition of Thewrewk de Ponor (Budapest, 1889), unfortunately never completed, and that of Lindsay (Leipzig, 1913). Consult Lindsay's *Præfatio*, and Teuffel, *Geschichte der römischen Literatur*, § 261, 5 (6th ed., ib., 1910).

FET, really Shenshin, Afanasy Afanasevich (1820–92). A Russian lyric poet. He was born in the Government of Orel. Of noble parentage, he entered first the faculty of law and later that of philology in the Moscow University, completing the latter course in 1844. The following year he joined the army and served in the Russo-Turkish War of 1853–56. Owing to difficulties with the family papers, he assumed his mother's name, Fet, under which he was known until 1874, when officially allowed to resume his real name, Shenshin. His first volume of poems, the *Lyric Pantheon* (1840), though well received at the time, was not very successful. Another collection of his verse which appeared 10 years later, however, met with considerable success. In 1860 he bought a country estate and became an agriculturist. Then for nearly two decades he only occasionally contributed articles on agriculture under the title *From the Country*. In 1877 he settled in the Government of Kursk and published a series of masterly translations of the Roman poets (Horace, Vergil, Catullus, Ovid, Tibullus, Propertius, Juvenal), translating also into Russian Goethe's *Faust* and Schopenhauer's *The World as Will and Idea*. In 1883 a third collection of his poems was published under the title of *Fires of the Night*. His *My Reminiscences* (2 vols., 1890) and *The Early Years of my Life* (a posthumous work) supply an abundance of biographical data.

FÊTE NATIONALE, fât nȧ'syô'nȧl'. The national holiday of France. Since 1880 the government has set apart July 14, the anniversary of the fall of the Bastille, as a day of national rejoicing. Military parades are held everywhere, public banquets and receptions, while every patriotic Frenchman decorates his house with the tricolor of the Republic. In 1892 a second fête nationale was officially decreed, the 22d of September, upon which day a republican form of government was established.

FETERITA, fĕt-ẽr-ē'te. A variety of nonsaccharine sorghum of the durra group, native to the Sudan. Its somewhat juicy stems are rather slender and vary from 4 to 7 feet in height. Under favorable conditions the plant readily produces suckers and branches which are later in maturing than the initial stems, thus causing unevenness in ripening. In habit of growth feterita differs from milo and white durra mainly in having erect heads and producing somewhat larger seeds. It ripens fully as early as dwarf milo and two to three weeks earlier than standard blackhull kafir and also compares favorably with these and other sorghums in drought resistance. The culture requirements are the same as for the grain sorghums generally. It is planted in rows 40 to 44 inches apart and from two to three weeks later than corn, to insure rapid sprouting of the seed, which requires a warm soil. The crop prefers a good, firm seed bed and may be planted with a lister or an ordinary corn planter. It is cultivated like corn and is also best harvested with the corn harvester and placed in shocks in the usual manner. When grown for grain and forage it is harvested just before the grain hardens, but when grown for the grain alone it should stand until the earliest heads are fully ripe. The heads are mowed from the stems and thrashed with an ordinary grain separator suitably adjusted. The forage is equal in value to that of milo, but not quite equal to that of kafir and the sweet sorghum. More than 50 bushels of grain have been produced per acre. Feterita was introduced into the United States by the United States Department of Agriculture in 1906.

FETI, fā'tȧ, Domenico (called Mantuano, from the fact that his chief works were executed at Mantua) (1589–1624). An Italian painter, born in Rome. He was a pupil of Lorenzo Cardi, called Cigoli. Ferdinand Gonzaga, Duke of Mantua, appointed him court painter. He painted a number of frescoes and works in oil in the cathedral there and then went to Venice, where he died, the victim of his intemperance. Feti inclined to the naturalism of Caravaggio, and in Mantua imitated Giulio Romano. He had considerable ability; but his pictures, though in many cases powerful in coloring, possess little style, being often ill-managed as to light and shade, and the vulgarity of his nature prevented his religious works from being of a high class. His paintings are well distributed through the galleries of Europe; Dresden has 11 of them, including "David with the Head of Goliath"; Vienna 10, among them, "The Flight into Egypt"; and the Louvre 4, including "Melancholy," one of his best efforts.

FETIALES, fē′shĭ-ā′lēz (Lat., speakers, from *fari*, Gk. *φάναι*, *phanai*, to speak). Roman priests who acted in international affairs as heralds in the announcement of war to a foreign state, and who presided over the solemnities attending the return of peace. Their duties were discharged with much ceremony. They were anciently citizens of high birth, were chosen for life, and were called *patres patrati*. Consult Livy, i, 24; i, 32; and also Frank, "The Import of the Fetial Institution," in *Classical Philology*, vii, 335–342 (Chicago, 1912); Lübker, *Reallexikon des klassischen Altertums* (8th ed., Leipzig, 1914).

FETID WOOD WITCH. See Fungi, Edible and Poisonous.

FÉTIS, fā′tēs′, François Joseph (1784–1871). A Belgian composer and writer on music. He was the son of an organist and played the organ in his native town (Mons) when only 10 years of age. He received his musical education in Paris and then traveled in Germany and Italy, studying the works of the great masters. In 1806 he returned to Paris, married a wealthy woman, and was enabled to devote his time to studying the history of music. In 1813 financial misfortunes compelled him to accept the position of organist and instructor in Douai. In 1821 he became professor in the Conservatory of Paris and published three years later his *Traité du contrepoint et de la fugue*. In 1827 he founded the *Revue Musicale*, a journal devoted to musical criticism. In 1833 he was appointed director of the Royal Conservatory of Brussels, which post he held until his death. He wrote much sacred and instrumental music and seven operas. His principal works are: *Biographie universelle des musiciens et bibliographie générale de la musique* (8 vols., 2d ed., 1860–65); *Histoire générale de la musique* (5 vols., 1869–75), reaching down to the fifteenth century only; *Traité complet de la théorie et de la pratique de l'harmonie* (11th ed., 1875). Consult Alvin, *Notice sur F. J. Fétis* (Brussels, 1874).

FE′TISHISM (from *fetish*, Fr. *fétiche*, from Portug. *feitiço*, artificial, from Lat. *facticius*, made by art, from *facere*, to make; the term was originally applied by Portuguese pioneers in western Africa to artifacts adored by the natives and supposed by them to possess magical potency). A form of belief and fiducial practice in which supernatural attributes are imputed to material objects, especially objects of artificial character; the practice includes sorcery, thaumaturgy, or magic, with various attendant ceremonies and minor observances. The fetish is usually a figure modeled or carved from clay, stone, wood, or other material in imitation of some deified animal or other object; frequently it consists of fur, feathers, hair, bone, or tooth of a tutelary animal; sometimes it is the animal itself, or some tree, rock, river, or place associated with the tutelary in the mind of the devotee; and in certain cases the belief is so definitely crystallized about the object itself that the customary connection with the tutelary eludes detection—when the belief may be said to grade into idolatry. First noted by Portuguese travelers in Africa, it is now recognized that fetishism is by no means confined to western Africa, but prevails among the primitive peoples of all lands; also that the belief does not represent a fairly definite stage in the development of fiducial notions and practices preceding, say, a totemic stage. Tylor limited fetishism to the doctrine of potencies (or spirits) attached to, or conveying influence through, material objects, in contradistinction from animism, which he defined as the doctrine of spirits in general, and also indicated the way in which fetishism grades into idolatry. However, according to recent data, West African fetishes need not be connected with spirits, except in so far as they are employed to counteract the activities of malevolent beings. Any natural object or artifact becomes a fetish when invested with supernatural power by appropriate incantations, rites, and a coating of magical substances. Fetishes therefore may assume various forms, and the occasional restriction of the term to effigies of human beings or animals is unwarranted by the facts. Significant vestiges of the early belief persisted among the ancient Greeks, who reverenced trees and sacred places; the Romans, who cast clods of native earth on the site of the sacred city; the Druids of England, who adored oak and mistletoe; the early Germans and Celts with faith in fairies, and many other peoples. See Man, Science of; Sophiology.

Consult: R. H. Nassau, *Fetishism in West Africa* (New York, 1904); R. E. Dennett, *At the Back of the Black Man's Mind* (ib., 1906); *Notes analytiques sur les collections du Musée du Congo*, Brussels, (La Religion), pp. 145–316; Pechuel-Loesche, *Die Loango-Expedition*, Dritte Abteilung, Zweite Hälfte, pp. 347–472 (Stuttgart, 1907); F. B. Jevons, *Introduction to the Study of Comparative Religion* (New York, 1908); R. H. Milligan, *The Fetish Folk of West Africa* (ib., 1912).

FET′LOCK, or **FETTERLOCK**. In heraldry, a form of padlock. Edward IV of England adopted this as a charge after the battle of Mortimer's Cross in 1471.

FEU, fū (from OF. *feu*, *fieu*, *fied*, *fief*, fee, from ML. *feudum, property held in fee*). In the law of Scotland, a right to the use and employment of lands, houses, or other heritable objects, in perpetuity, in consideration of an annual payment in grain or money, called *feu duty*, and certain other contingent burdens called casualities of superiority. Though "feu" was, like "feud" and "fee" in English law, formerly used to express any kind of tenure by which the relation of lord and vassal was constituted, in its narrower meaning which we have here indicated, and which is that in which it is now almost exclusively used, it was opposed, on the one hand, to those tenures in which the return consisted of military or other personal service and, on the other, to those in which the return was illusory, the only object of which was to preserve the relation of superior and vassal. A feu, in short, was a perpetual lease—a feu farm, as it was often called—by which the tenant became bound to pay a substantial consideration, and his rights under which he might forfeit, as the penalty of nonpayment. In the present day the disposal of land in feu is practically a sale for a stipulated annual payment, equivalent to chief rent. It is in this light, accordingly, that feus are generally regarded in Scotland; and though feus resemble English freeholds in substance, their forms agree mostly with copyhold tenure. See Paterson, *Compendium of English and Scotch Law* (2d ed., Edinburgh, 1865).

FEUCHTERSLEBEN, foiK'tĕrs-lā'ben, Ernst, Baron von (1806–49). An Austrian physician, philosopher, and poet, born in Vienna. He studied in the university of that city, became lecturer in medicine there in 1844, and was made Undersecretary in the Ministry of Public Instruction in 1848, but resigned in the same year. His *Lehrbuch der ärztlichen Seelenkunde* (1845) was translated into English, and others of his attractively written medicophilosophical works enjoyed a high reputation. He is, however, best known by his *Zur Diätetik der Seele* (1838), which is still widely read. His nonmedical works, with a biography (7 vols.), ed. by Friedrich Hebbel, were published in 1851–53. Some of his lyric and didactic verses appear in most anthologies. His best-known poem, *Es ist bestimmt in Gottes Rat*, set to music by Mendelssohn-Bartholdy, has become a *Volkslied*.

FEUD (AS. *fæhþ*, enmity, from *fāh*, hostile, OHG. *fêheda*, Ger. *Fehde*, hatred, OIr. *ólch*, enemy, Lith. *piptas*, bad, OPruss. *popaikā*, he deceives). A war waged by one family or small tribe on another, to avenge the death or injury of one of its members. It prevailed extensively among the nations of northern Europe, and it was only by gradual steps that the practice was first restricted and then abolished. The laws of the Emperor Rudolph I recognized the right of private war. At last partial associations were formed, the members of which bound themselves mutually to settle their differences by courts of arbitration and compensation without going to war. The practice, however, continued in many parts of the world and has survived to the present day in the feuds of the Kentucky and Tennessee mountains in America and in the Corsican *vendetta*. See Feudalism.

FEUD (in Law). See Fee.

FEUD'AL AR'CHITEC'TURE. A term applied to architecture during the feudal age, i.e., from about the tenth century to the fifteenth. (See Gothic Architecture; Romanesque Art.) It is generally used in reference to the military architecture of that period, which will be found treated in the article Castle.

FEUD'ALISM (Fr. *féodalisme*, Sp., Portug., It. *feudalismo*, from ML. *feudum*, Eng. *feud*, from OHG. *fihu*, AS. *feoh*, cattle, Lat. *pecu*, Skt. *paśu*, cattle). The name used for a group of customs, embracing the political and economic sides of life, which gave to society its characteristic shape during the greater part of the Middle Ages. The rise of the institutions which we call feudal became noticeable shortly after the Germanic invasions, and they attained their highest development from the ninth to the thirteenth century. With the beginning of the fourteenth century certain nonfeudal institutions appeared, and gradually a more modern type of society began to take form. These changes, slow at first, became more rapid and fundamental until eventually the feudal system, as such, was quite overthrown, though certain customs lingered far down into modern times and in some few respects still exercise considerable influence in various countries. Feudalism, therefore, must be studied in its origin, its period of highest development, and its decline; and in the examination of the chief features of the system attention must be paid to the way in which it affected (1) personal relationship, (2) landholding, and (3) the distribution of political power.

The Origins of Feudalism. 1. *Personal Relationship.*—Amid the disorders and insecurity of the early mediæval period it became very usual for men of low rank and little strength to "commend" themselves to men of higher position and greater power. This "commendation" might be to the King, in which case an additional and closer bond was created than that between ruler and subject; or it might be to a noble or a church corporation, or even merely from one freeman to another. Commendation tended to become a formal procedure accompanied by an oath of fealty and service from the inferior to the superior. The relationship thus established was known as that between vassal and suzerain, or man and lord, and the ceremony as "homage and fealty."

2. *Landholding Relationships.*—Landed estates were frequently granted by kings, or other possessors of extensive landed property, to persons who should hold these estates for their own use, but should, in acknowledgment of having received them, perform certain services, or make certain payments, to the grantor. In early times such grants do not seem to have been considered as hereditary, but they tended to become so. Rulers obtained lands to be thus disposed of by conquest and confiscation; men of lower rank received such extensive royal grants that they were in a position to make similar grants on a smaller scale to others. During the same period many holders of land in full ownership gave it to powerful persons or bodies, especially to the Church, taking it back for possession during their own lifetime or during the lives of a certain number of heirs. Such a grant was called a "precarium" and was often held in practically hereditary tenure by the original donor and his successors, although the ultimate title to it was vested in a third person or corporation. In these ways there came to be but little land that was actually owned by the person who occupied it, and but little that was directly claimed by the person who received payments from it. Land had come to be "held" by one man from another, and land "tenure" had taken the place of land "ownership." A piece of land held in this way was called at first a "benefice," later a "fief," a "fee," or a "feud"; the procedure by which it was granted was known as "enfeoffment," and the relation between the person holding it and the person from whom it was held as that between landlord and tenant. See Fee; Feoffment.

Next, it is to be noted that the personal bond of homage and fealty and the relation of landlord and tenant tended to run together. Men usually commended themselves to the lord from whom they held their land; a person receiving a fief from the King was both his tenant and his vassal; and when a landholder enfeoffed a tenant he usually received an oath of homage and fealty from him. The conception of vassalage and tenancy became inseparably bound up together. Sometimes, it is true, a fief consisted of something else than land. It might be an office or even a regular income, held on condition of fealty, homage, and feudal service; but after the tenth century, in most western countries of Europe, the possession of any considerable holding of land without the accompaniment of personal homage and fealty to some lord was almost unknown.

3. *Powers of Government.*—Large monarchies, under the conditions existing in the early Middle Ages, could only be governed by placing their different sections or provinces under governors or viceroys. In the Empire of the Franks these were known as counts; in England, as ealdorsmen; later, earls. When the King was a strong man, and his government well organized and orderly, the governors were appointed officials with limited powers and a temporary, or at most a life, tenure of office. During the disorders of the ninth and tenth centuries, however, the provincial rulers obtained extensive local powers. They exercised such functions of government as taxation, the raising of military forces, the administration of justice, and the coinage of money. Moreover, their positions came to be looked upon and treated as hereditary. In many cases their power was strengthened by the fact that the district over which the count ruled had been occupied earlier by an independent race or tribe and had been brought into the monarchy only by conquest or annexation. The surviving race feeling, therefore, now attached itself to the local ruler. In addition the semi-independent political powers of these rulers over whole districts were closely combined with the personal and landholding relationships already described. Men naturally commended themselves to the nearest powerful lord and performed the services due for their land to him. Ecclesiastical bodies, bishoprics, and abbeys, which were the holders of such a large proportion of the land, and whose estates were considered as being held feudally, were naturally dependent upon the good will of the local ruler to defend them from the attacks of others and to refrain from aggression upon them himself. These rulers also had lands in their possession which they granted out as fiefs to be held from themselves by persons who were thus alike their subjects, their tenants, and their vassals. Thus, in the case of these great lords of whole districts, political powers, the rights of a feudal landlord, and personal lordship were inseparably combined. It is this close union of the powers included under the modern conception of government with a system of landholding and with personal relations of fealty that forms the fundamental character of feudalism and lies at the base of the legal institutions of the Middle Ages. In the great lordships, at first, a fief involved not only the possession of land and of personal claims and duties, but of most of the important rights of government over the persons dwelling on the land.

In the course of time the same conditions came to prevail in a partial degree in smaller lordships too. When the King gave away land, he frequently granted to the new holder all kinds of claims which he possessed over the people dwelling on the land. In the ninth and tenth centuries, e.g., the King in many cases, especially in land granted to the Church, promised that royal officials should not intrude, in the future, upon the land for purposes of taxation, administration of justice, or military levy. This left it open to the landholder to exercise those rights upon his tenants, who thus became practically his subjects as well. Such royal grants were known as "grants of immunity," or "immunities." In England similar grants were made in late Anglo-Saxon times, reciting the privileges of "sac and soc," "toll and team," and other franchises now imperfectly understood. Sometimes only partial rights of government were given in the immunities, as where the King granted all pecuniary profits from court jurisdictions over a certain district, but did not give any other powers. Ultimately, as feudal conditions became so nearly universal, it was considered that landholding in itself involved the possession of certain political rights over the tenants of the land, the extent of these rights being dependent on the customs or circumstances of each particular case; and in this manner, in the lower as well as in the higher grades of holding of landed estates, there was the same union of proprietorship of the land, lordships over vassals, and rights of sovereignty over inhabitants. In the creation of this complex mass of personal and territorial relations, there was much that was a matter of voluntary choice, but still more that was the result of the exercise of compulsion. The early Middle Ages were a period of violence and disorder, and feudalism was rather a resultant from the conflict of different forces than any planned or logical scheme. Nevertheless a certain equilibrium was reached, if it was only the recognition of the common interests of oppressor and oppressed, of the powerful and the weak; in spite of a thousand variations, from country to country, from estate to estate, from person to person, there was a certain amount of uniformity. It is this degree of consistency which has suggested and partially justified the use of the term "feudal system," and, taking it in this sense, it is possible to give an approximate description of this general body of feudal customs.

The Feudal System. About the thirteenth century a number of treatises or codifications of feudal law and customs were drawn up, such as that of Beaumanoir and other similar *Coutumiers* in France, the *Sachsenspiegel* and *Schwabenspiegel* in Germany, and the *Libri Feudorum* in Italy. The appearance of these feudal codes, as well as other facts arising from a direct study of institutions, seems to point to the thirteenth century as the culminating period of feudalism, though the course of its development was very different in different countries. From the point of view of landholding, feudalism was most complete in England, owing doubtless to the occurrence, just in the constructive period of feudal institutions, of the Norman Conquest with its accompanying confiscations and regrants. Independent political powers were developed most completely in Germany or Italy, but, on the whole, feudalism may be said to have had its most symmetrical development in France, and it is there studied most satisfactorily as a complete system.

The base of the whole structure was the fief.

A fief was a body of land; it might be made up of a large stretch of contiguous territory or of many separate tracts, or it might be a single estate, or even possibly a comparatively small number of acres in a certain manor or township, which a tenant held from his lord on condition of certain "feudal" services. When the fief was first granted, or when it was obtained by inheritance, or when a new lord succeeded to the suzerainty, a ceremonial "investiture" took place according to the traditional forms of the ceremony of fealty and homage. The tenant kneeled before the lord, placed his clasped hands between the hands of his lord, and in this attitude swore to be his man and to preserve fidelity to him in all things. The lord accepted the fealty and homage by kissing the tenant and inferentially promising him his protection and patronage, and by conveying to him, frequently by some symbolic action, the fief of which the vassal now became possessor.

The services owed by the tenant were of the following general classes: Military service was the duty of serving his lord in war with a certain number of men for a certain time; according to a widespread custom, once a year and for 40 days. So general was this duty that feudal tenure is frequently called military tenure. Court service was the twofold duty of coming when summoned to be a member of a body to decide in cases concerning one of his "peers" or fellow vassals of the same lord, and of submitting himself to the jurisdiction of such a court or of his lord. "Wardship" is the term applied to the right of the lord to assume the guardianship of the minor heir of a deceased tenant and the income from the estate during the minority, with the requirement, however, that the proper support and education of the heir be provided for from the estate. "Marriage" similarly was the right of the lord to control the choice of a husband for the heiress or the widow of a tenant and frequently of a wife for the heir. These last two forms of service reduced themselves practically to the imposition of a money fee proportionate to the value of the estate concerned. Military service also was frequently transformed into a money payment. There were other direct money payments, although usually at quite uncertain intervals. Of these, "relief" was a money fee due from an heir on the acquisition of his property. It was very commonly estimated at a sum equal to the value of one year's income of the estate. "Aids" were payments of an amount settled by custom under certain contingencies; the three most generally recognized were: (1) to defray the expenses of knighting the lord's eldest son; (2) of the marriage of his daughter; (3) of his ransom in case he were captured in war. These were not usually exacted by any feudal lord except the King, and by him only from his direct tenants or tenants in chief; but these in such a case might call upon their tenants to reimburse them for what they had paid to the King. Finally, "escheat" and "forfeiture" were the conditions in which the fief could be taken back by the lord—the former in the case where there was no heir, the latter in the case where the tenant had failed in the performance of his feudal obligations. "Subinfeudation" is a term used to describe the grant of a portion of a tenant's holding to another person, to hold from him on terms similar to those on which the first tenant holds from his lord. Generally speaking, all the land of a country was held from the King by a comparatively small number of direct tenants, known as tenants *in capite*, or *in chief*. Many of these had very large fiefs, consisting of a vast number of estates. They granted some portions of their holdings, as lesser fiefs, to others, and these a still further portion to others below them, and so on till there were frequently six, eight, or more *mesne* or "mean" lords between the actual tenant of a certain estate and the King from whom it was ultimately held. All tenants below those *in capite* were known as "subtenants."

Feudal Society. The people were divided, according to contemporary writers, into three classes: those who did the fighting, the nobles; those who did the praying, the clergy; and those who did the work. The nobles were necessarily warriors. In order to be able to devote themselves to fighting, they were obliged to have an income sufficient for their support, and for equipping themselves and their followers when they went to battle. They were the holders of the estate, which will be described below when the workers are treated of. The rank of a noble depended upon the extent of his possessions. The rulers of provinces who could lead immense bands to war were designated as dukes, marquises, or counts. Below these were barons and knights, who held varying amounts of property which enabled some to lead large troops of followers to battle; others were under the necessity of serving in the following of some more wealthy noble, usually the one from whom they held their fief. Lowest of all were the squires, or attendants upon the knights, who at first had no land, but later acquired large estates. They formed the great mass of the nobility in the thirteenth century. The home of the noble was his castle. There he lived as a petty monarch, exercising authority over his vassals and tenants. When he was not engaged in war, he devoted himself to the management of his fief or to hunting. The management involved more than merely looking after the property; for the lord had the executive, judicial, and administrative powers all in his own hands. He had to hold courts, administer justice, and police his fief. Hunting was not merely a pastime, but one of the chief means of supplying food for the table.

The noble's wife (châtelaine) had charge of the household and superintended the work of the maids, who did the spinning and weaving. She had to know something of medicine and nursing, as the care of the wounded and sick devolved upon her. In her husband's absence she was obliged frequently to take his place in defending the castle or administering the fief. In her leisure moments she might embroider tapestries or play chess; such are the occupations generally depicted in the *chansons;* but in reality the lady usually was busy with her household duties or in making clothes. The bunch of keys which she wore at her girdle was the fitting emblem of her duties. The education of the daughter of a noble was devoted wholly to giving her a knowledge of the duties which she would be expected to perform. (The education of the son has been discussed under CHIVALRY.) With the acquisition of wealth, after the twelfth century, games, minstrelsy, and tournaments became common. Prodigality was the prevailing characteristic of the age and soon impoverished most of the nobles. Even in this age, which is glorified by the poets, luxury and lack of comfort went hand in hand. At the gorgeous festivals in the castles many things which we now consider necessaries were wholly lacking.

The members of the clergy were originally either nobles or peasants. Their duty was to pray, and to care for the moral welfare of the society. As a rule, they were somewhat better educated than the other members of the community. The bishops and the abbots were great landholders and had the same responsibilities as the lay nobles, from whose life their own often differed but little. At the other extreme of the clerical body were the village priests, who had sprung from the people and shared the lot of the latter.

Those who did the work were the peasants. They were obliged to support not merely themselves, but also the nobles, by whom they were generally despised as inferiors. They lived usually in villages, about which stretched the lands which they cultivated. Some of the peasants were freemen; others, serfs. In fact, there were many gradations in social rank according to the amount of freedom which each class possessed. Here we can notice only the two general classes. The freemen held land from the lord of the fief which could not legally be taken from them. For this they paid a fixed rent which could not be increased by the lord. The serfs also had holdings of lands which could not be taken from them; but as payment for their lands they owed personal services and a part of their crops to the lord of the fief. He, or his representative, lived in a castle or fortified house a little apart from the village. Near the castle was a tract of land which the lord kept in his own possession, to be worked by the peasants for his profit. The remainder of the land was divided into long, narrow strips held by the peasants, no peasant, however, being allowed to hold a number of adjacent strips. The cultivation of the land was carried on in common by the holders of neighboring strips. The villagers were bound closely together by their common work and mutual responsibility, for each village was collectively responsible for the order within its limits. See MANOR.

Some of the villages grew into towns by the erection of fortresses or because of their favorable location for trade. The towns were, like the villages, the property of some lord or lords. But the townspeople were usually engaged in manufacturing or trade and thus obtained wealth. Consequently they were able to form effective associations (see GUILDS), which bought or usurped the rights which the lords possessed to collect payments from them. Many obtained charters of liberties and became almost self-governing communities. Individual merchants acquired wealth and vied with the nobles in luxury and ostentation. The members of the "third estate," as the townspeople came to be called, secured representation in the national assemblies and gradually emerged from their despised condition to become the real backbone of the nations.

Military Organizations. The element of personal relationship, which is the main characteristic of the feudal system, affected to a marked degree the organization even of the mediæval army. The fighting force under feudal conditions was marked by four main characteristics: (1) its members were a military class; (2) they fought as cavalry; (3) they were grouped in small irregular units; and (4) they fought almost without strategy or tactics. The first of these characteristics arose from the fact that all military service was provided as a return made by a vassal for the grant of land. When land was granted by kings and great nobles to vassals on condition of military service, the capacity to furnish this service when demanded was requisite, and therefore men with military training and equipment were a necessity. Military service was also doubtless a source of pleasure and a matter of pride, since the fighting class was also the landholding and the ruling class. (2) The fact that a feudal army was a mounted body arose from the nature of the times in which feudalism arose. In the ninth and tenth centuries Northmen, Magyars, and Saracens were in the various parts of Europe making rapid forays into the old settled regions, and to meet them successfully it was necessary to have a force that could move as rapidly as they. Therefore the counts and kings who were engaged in defending their territory against these invaders substituted mounted troops for the foot soldiers employed formerly in the civil wars or in the invasions of the Roman Empire. There were some foot troops usually included in a feudal army, but their employment in fighting was quite subordinate. An important exception to this, however, was the case of England, where the archers from a very early time constituted a valuable part of the field forces and repeatedly showed themselves superior to the chivalry of France. (3) The third characteristic, the lack of a hierarchy of leaders, and of a series of divisions and subdivisions of the parts of an army, arose from the way in which it was recruited. Each count, baron, or gentleman brought with him a smaller or larger group of knights and continued to act as the leader of his group during the fighting. The only regularity was in cases where the lesser knights and esquires were brought to an engagement in squads under the leadership of royal officials. But in most countries these were only a small part of the whole body of fighting men. Any such arrangement as the modern divisions of brigades, regiments, and companies was entirely unknown and inapplicable to the prevalent style of fighting. (4) With this organization, or lack of organization, there could be no system of tactics. There was usually some crude grouping of the whole body of troops into two or three "battles," under different leaders; but as a matter of fact the fighting men usually began the onset as soon as they came in sight of the enemy, and the engagement rapidly became a mere mêlée, or series of separate encounters. Fine personal valor and great personal skill and strength were often displayed in such contests; but the army as a whole was very ineffective. Similarly strategy or planning for a large campaign usually consisted simply in passing into the enemy's country and, while rather languidly seeking an engagement, burning and plundering the property of the enemy's subjects. The great feudal weapons were the lance and the battle-axe, with some use of the sword. (See BATTLE-AXE.) There was a development of body protection from the mere coat of mail and headpiece to full plate armor. See ARMOR; BREASTPLATE; CHAIN MAIL; HELMET; SHIELD.

Such feudal armies were characteristic of the eleventh, twelfth, and thirteenth centuries. The Crusades made less change in warfare than might have been anticipated, the Western armies remaining much the same in organization. By the fourteenth century, however, some new elements were grafted on this system. Hired bands of mercenaries were largely employed (see BRABANÇONS; CONDOTTIERI), and these were somewhat better organized and handled. Certain new troops were used, or old forms brought into a new prominence. The Swiss pikemen and halberdiers, fighting in a solid phalanx, frequently overwhelmed a more purely feudal army of armored cavalry, especially when the fighting was in a mountainous country. The English bowmen, armed with the rapidly discharged and effective longbow, were used in connection with heavy-armed cavalry and men at arms. Their rapid and deadly flight of arrows threw into confusion any stationary body of feudal troops opposed to them and put this body at the mercy of the knights whom the archers were supporting. If the opposing cavalry force was charging, the arrows retarded their advance so much as to make its onset ineffective. The effort to meet these new conditions or to utilize them to the best advantage, along with the other influences of the time, gradually led to a diversification of tactics and eventually to the organization of the modern type of armies. The invention of gunpowder and its gradual introduction in warfare was rather an element in the development of modern military systems than a source of any sudden change.

The Decay of Feudalism. Feudalism was in its very nature anarchic. The possession of military power was an incitement to its use in the settlement of private feuds; the imperfect subjection of vassals only slightly less powerful than their lords led to frequent resistance on their part; the absence of a strong central government, resulting from the possession of sovereign rights by the nobles, diminished the salutary power of enforcing order from above. The feudal castle, fortified and guarded, held in the name of the ruler, but frequently used as a base of operations to despoil and tyrannize over the surrounding country, and to wage petty warfare with other feudal nobles, was as characteristic an element of feudalism as were the legal and economic features which have been described above. During the latter part of the Middle Ages, from the thirteenth century onward, other institutions were being developed which did not fit into the feudal system. Town life, trade, and commerce, a well-to-do free middle class, and strong centralized monarchies grew up in the various western countries, so that feudalism became restricted to a less and less extensive proportion of human interests. Even in those fields in which feudalism had been dominant, in landholding, personal relations, and the powers of government, fundamental changes were taking place. Land came to be generally held on condition of mere pecuniary payments and became a subject of purchase, sale, and bequest. Contractual relations, and those of subject and sovereign, took the place of the personal bond of earlier times. Military powers, the right of taxation, the right of coinage, even the right of court jurisdiction, were withdrawn by the national governments from the feudal barons. During the thirteenth century in England, the fourteenth in France, and the fifteenth in Germany, the kings were able to put an end to private warfare and to reduce feudal jurisdiction to a definite inferiority to that of the King. Notwithstanding the decay of feudalism in these respects, however, class distinctions based upon it, certain privileges of taxation, and peculiarities of landholding continued to exist until in France they were swept away by the Revolution, in 1789, while in Germany and England traces of their influence may still be found.

Bibliography. The older works are of little use now. The following general works are especially valuable in themselves, and also contain many references to monographs treating different phases of feudalism: Luchaire, *Manuel des institutions françaises* (Paris, 1892); Esmein, *Cours élémentaire d'histoire du droit français* (ib., 1901); Seignobos, *Feudal Régime*, trans. by Dow (New York, 1908); Sécrétan, *Essai sur la féodalite* (2 vols., Lausanne, 1858); Flach, *Origines de l'ancienne France* (3 vols., Paris, 1866–1904); Viollet, *Histoire des institutions politiques* (2 vols., ib., 1890–98); Abdy, *Feudalism: Its Rise, Progress, and Consequences* (London, 1890); Stubbs, *Constitutional History of England*, vol. i, 6th ed., ib., 1897); Pollock and Maitland, *History of English Law* (2 vols., Cambridge, 1895); Gautier, *La chevalerie* (Paris, 1895; Eng. trans., London, 1891); Schultz, *Das höfische Leben zur Zeit der Minnesinger* (2 vols., Leipzig, 1879–90); Prutz, *Age of Feudalism and Theocracy* (Philadelphia, 1905; vol. ix of *History of all Nations*); Munro, *Seigniorial System in Canada* (New York, 1907): *Feudal Aids*, vol. v (London, 1909); Round, *Feudal England* (ib., 1909); Petersen, *Über den Kurmärkischen Adel im 17. Jahrhundert* (Berlin, 1911).

FEUDAL SYSTEM. See FEUDALISM.

FEUDAL TENURE. The system by which land was generally held in western Europe during the Middle Ages. It allowed one man to hold the title, while the use belonged to some one else. The former was known as the lord or suzerain, while the latter was the vassal and owed service for the land. If the vassal was a noble, his service was generally of a military nature, while if he was a villein, his service was usually in the form of work on his lord's estate. The noble's land was known as a fief (see FEE), and there was nothing to prevent him from holding of several lords, but the one to whom he owed service primarily was known as liege lord. In some parts of Europe the feudal system had made little or no headway. Here property was held in fee simple, which was known as allodial tenure, and the separate estate was the allodium. See FEUDALISM.

FEU DE JOIE, fē de zhwä (Fr., fire of joy). A form of musketry fire reserved for the celebration of some joyful event, as, e.g., the observance of the King of England's birthday in the British army. The troops are formed in line, in two ranks, at open order. On the command *present*, rifles are brought to that position, with the muzzles pointing upward, care being taken to secure a uniform angle of elevation. On the command *fire*, the right-hand man of the front rank discharges his rifle, followed at scarcely perceptible intervals by the men on his left successively. When the extreme left of the front rank is reached, the left-hand man of the rear rank immediately follows, the fire being similarly continued until the extreme right is attained, when the round is completed. Three rounds, as a rule, are fired on such occasions. The random or independent discharge of firearms in the air, common to Indians and other uncivilized bodies of warriors, might be termed a feu de joie.

FEUERBACH, foi′ĕr-bäG, ANSELM VON (1829–80). A German historical painter. He was born at Speyer, Sept. 12, 1829, the son of the archæologist Anselm Feuerbach (1798–1851). His artistic proclivities having been early awakened in the course of his education at Freiburg (1836–46), he went to Düsseldorf in 1846, where he studied under Schadow and Rethel, and later to Munich, to work under Rahl. In order to perfect himself in color, he proceeded to Antwerp in 1850 and thence to Paris. Under the guidance of Couture he acquired that minute finish of form and broad coloristic treatment which are characteristic of his works. The first of these was "Hafiz at the Inn" (1852). Leaving Paris in 1853, he painted at Karlsruhe the "Death of Pietro Aretino" (1854) and in 1855 went to Italy, with a stipend from the government; working first in Venice, where he made a masterly copy of Titian's "Assumption," and painted a "Colossal Figure of Poetry" (1856), now in the Karlsruhe Gallery. From 1856 to 1872 he was in Rome, where, absorbed in the enthusiastic study of the great Italian masters, he developed his individual style. The first fruit of this tendency was his "Dante with the Noble Ladies of Ravenna" (1858), which is distinguished by golden glow and depth of color. In Rome Feuerbach found a munificent patron in Baron von Schack, who acquired a number of his canvases for his famous collection in Munich, foremost among them the impressive "Pietà" (1863), besides "Francesca da Rimini and Paolo" (1864), "Ariosto with the Ladies at Ferrara," "Hafiz at the Fountain" (1866), "Laura and Petrarch at Avignon," "Idyl from Tivoli." From his sojourn in Rome also dates the charming "Madonna Surrounded by Angels Making Music" (1860, Dresden Gallery). More and more he confined his choice of subjects to the antique world, striving to give expression to his ideal—the cult of beauty—in serious and lofty themes. He understood, better than any other modern artist, the noble and simple dignity of antique art; but he lacked the joyousness of the antique spirit. A tinge of asceticism pervaded his works, mingling an intensely personal note with their grave majesty. In Rome his glowing color became cooler and his efforts were concentrated upon psychic expression. Thus originated "The Banquet of Plato" (1867, in Karlsruhe Gallery), in a second conception of which, on a larger scale (1873, National Gallery, Berlin), he reaches the greatest heights of classical inspiration; "Medea Preparing for Flight" (1870, New Pinakothek at Munich); "The Judgment of Paris" (1870, Hamburg Gallery), one of his most forceful compositions; "Iphigenia in Tauris" (1871); and the "Battle of the Amazons" (1873, Nuremberg Gallery). In 1873 Feuerbach was appointed professor at the Vienna Academy, but, embittered by lack of appreciation, he resigned in 1877 and retired to Venice, where he died Jan. 4, 1880. His last works were the exquisite though unfinished "Concert of Venetian Girls" (1878, National Gallery, Berlin), and the "Fall of the Titans" (1879, Vienna Gallery). Feuerbach's subtle personality is revealed to us in his autobiographical work, *Ein Vermächtnis von Anselm Feuerbach* (Vienna, 5th ed., 1902). Consult Pecht, in *Zeitschrift für bildende Kunst*, viii (Leipzig, 1873) and the monographs on Feuerbach by Allgeyer (Stuttgart, 1904), Heyck (Bielefeld, 1905), and Uhnde-Bernays (Stuttgart, 1913).

FEUERBACH, LUDWIG ANDREAS (1804–72). A German philosopher, fourth son of Paul Johann Anselm Feuerbach. He was born at Landshut. After studying theology for two years at Heidelberg under Paulus and Daub, in 1824 he was attracted to Berlin for the purpose of hearing Hegel, and soon afterward he abandoned theology to devote himself entirely to philosophy. In 1828 he became privatdocent in the University of Erlangen, but in a few years quitted the academical life on account of the offense he had given by the publication of an anonymous book attacking the belief in immortality (*Gedanken über Tod und Unsterblichkeit*, 1830). He now gave up his whole time to literary labor, residing at Ansbach and then at Bruckberg near Bayreuth till 1860, when he settled near Nuremberg. During the next few years he published three works on portions of the history of philosophy, treating the period from Bacon to Spinoza, and the theories of Leibnitz and of Bayle. But these historical works only paved the way to a critical investigation into the nature of religion and its relation to philosophy. The most celebrated result of this is his work on the nature of Christianity (*Das Wesen des Christentums*, 1841), which was translated into English by George Eliot under the title *The Essence of Christianity*. This was followed in 1845 by *Das Wesen der Religion*. Starting from the Hegelian doctrine that the absolute comes to consciousness in humanity, Feuerbach denies to God any existence except as an idealized object of human consciousness. The conception of God is thus merely the projection by man of his own ideal into the objective world. All authority above man is regarded as a delusion proceeding from man himself, and the highest good is explained as that which is, on the whole, most pleasurable. Yet even this highest good is further explained as consisting in resemblance to that ideal humanity which man creates for himself and worships as God. In a later work he says that man is only what he eats (*Der Mench ist was er isst*). In the last years of his life he devoted himself to ethical studies, which he pursued in a hedonistic spirit. (See HEDONISM.) Although the impulse towards pleasure is for him the basis of all morality, the pleasure of others must be considered as of equal importance with one's own pleasure. (See UTILITARIANISM.) Feuerbach was a man of high ideals in spite of his philosophical materialism. He made numerous friends both at home and abroad, and his writings were very popular. The works of Feuerbach were collected and published in 10 vols. (Leipzig, 1846–66). A later edition has been published, *Sämmtliche Werke* (10 vols., Stuttgart, 1905–06). For his life, consult: Grün (Leipzig, 1874); Beyer (ib., 1873); Starcke (Stuttgart, 1885); Jodl, *Ludwig Feuerbach* (ib., 1904). For his philosophical system, consult Engels, *Ludwig Feuerbach und der Ausgang der klassisch-deutschen Philosophie* (ib., 1888), and Bolin, *Ludwig Feuerbach und seine Zeitgenossen* (ib., 1891).

FEUERBACH, PAUL JOHANN ANSELM VON (1775–1833). A distinguished German jurist, born near Jena, Nov. 14, 1775. Brought up at

Frankfort-on-the-Main, where his father was an advocate, and educated in the gymnasium there, he went in 1792 to Jena, where he studied law and philosophy. In 1798 he appeared as a criminal jurist in a work entitled *Philosophisch-juristische Untersuchung über das Verbrechen des Hochverrats*, and in the following year he began to deliver lectures in the University of Jena. In his lectures and published writings he introduced into criminal jurisprudence a new method of treatment, which was systematized in his compendium of German penal law (*Lehrbuch des gemeinen in Deutschland geltenden peilichen Privatrechts*, Giessen, 1801; 14th ed. by Mittermaier, 1874). This celebrated work placed Feuerbach at the head of the school of jurists who maintain that the decision of the judge in every case ought to be determined solely by a literal application of the penal law, never by his own discretion, and who on that account obtained the name of "rigorists." In 1801 Feuerbach was appointed full professor in Jena, but in 1802 accepted a call to Kiel. In 1804 he removed to the University of Landshut; but the next year, having received a commission to prepare a penal code for Bavaria, he was transferred to Munich, and in 1808 he was appointed Privy Councilor. The new penal code which he planned for Bavaria (*Strafgesetzbuch für das Königreich Baiern*, München, 1813) received the royal approval and was taken as a basis for the emendation of the criminal law of several other countries. During this period also he published his "Remarkable Cases in Criminal Law" (*Merkwürdige Kriminalrechtsfälle*, 2 vols., Giessen, 1808–11), which first led the way to a deeper psychological treatment of criminal cases. In 1812 he published a work on trial by jury, to which a second volume, on the judicial procedure of France, was added in 1825. In 1814 he became second president of the Court of Appeals in Bamberg, and in 1817 first president of the Court of Appeals at Anspach. In 1832 he published a work on Kaspar Hauser, whose mysterious fate had strongly attracted his interest. He had just edited a collection of his miscellaneous writings, when he died at Frankfort-on-the-Main, May 25, 1833. An interesting life of Feuerbach was written by his son Ludwig, *Leben und Wirken Anselm von Feuerbachs* (2 vols., Leipzig, 1852).

FEUERKRÖTE, foi'ĕr-krẽ'te (Ger., fire toad). A common and curious frog (*Bombinator igneus*) of Europe, called "fire-bellied" because of the vivid flame color, marbled with black, of its underparts. The abdominal surface is smooth, but the upper surface, which is olive green, is extremely warty and toadlike. Two varieties (or perhaps species) are recognized, the orange-bellied of the lowland marshes and the yellow-bellied of mountainous regions. It extends eastward into temperate Asia, but is not known in Great Britain. It is essentially aquatic. The female utters a high-pitched cry and is exceedingly shy; the tadpoles grow to an unusually large size, especially in respect to their tail fin. These frogs are interesting as representatives of the peculiar family Discoglossidæ (q.v.) and also for the remarkable way in which, when they think themselves in danger, they assume an erect, stiffened attitude intended to display the bright "warning colors" of their bellies. This is correlated with the fact that their skins yield an exceedingly poisonous secretion, so that no known bird or mammal eats them. Consult Gadow, *Amphibia and Reptiles* (London, 1901).

FEUERSNOT, foi'ĕrs-nŏt' (Ger., The Lack of Fire). An opera by Richard Strauss (q.v.), first produced at Dresden, Nov. 21, 1901.

FEUILLANTS, fẽ'yäɴ'. The name applied to (1) a religious congregation, springing out of the Cistercian Order and taking its name from the mother house of Feuillant, Lat., Fulium, near Toulouse. Its founder was Jean de la Barrière, who was abbot of this monastery from 1562. Protestantism made inroads upon his community and the ancient discipline was relaxed. Finally, after courageous efforts at enforcement of the rule, he was deserted by nearly all his monks and himself accused as an innovator before the General Chapter at Cîteaux. He defended himself so successfully that a number of the old monks put themselves under his guidance, and he instituted a severer mode of life than had of late been customary in Cistercian houses. They came to Paris in 1587, protected against the Huguenots by a troop of cuirassiers, to take possession of the convent founded for them by Henry III. The reform was confirmed as a separate congregation by Sixtus V in 1589. In 1630 Urban VIII divided them into two branches—the Italian, known as Reformed Bernardines, and the French, who still kept the name of Feuillants, each under a general of its own. At the Revolution they possessed 24 abbeys in France. Cardinal Bona and other famous theologians have belonged to this order. Barrière also founded a community of women, and Cardinal Rustico did the same at Rome, placing his under the direction of the Feuillant fathers. Anne of Austria founded a house for them in Paris in 1662.

2. A faction in the assembly of the clergy in Paris (1755), which discussed the execution of the constitution *Unigenitus*. At this time Cardinal de la Rochefoucauld, Archbishop of Bourges, was appointed Minister of Public Worship (*de la Feuille*, hence the name) and took the lead of a sort of ministerial party, Gallican and half Jansenist in tone, which formed a small majority of the assembly. See GALLICAN CHURCH.

3. A political club in Paris during the early years of the French Revolution, originally known as the Society of the Friends of the Constitution, or the Club of 1789. It met in the ancient convent of the Jacobins and comprised a majority of the members of the Constituent Assembly. With the progress of radical ideas the friends of monarchy in the society grew discontented, and in July, 1791, more than 300 deputies, among them Barère, Lanjuinais, Sieyès, Lafayette, and the Lameths, seceded, taking up their home in the convent of the Feuillants in Rue Honoré. (See above.) Those who remained came to be known specifically as Jacobins (q.v.). The Feuillants lost rapidly in numbers and influence; as a group of well-fed men who believed in a constitutional monarchy, they were hated alike by Jacobins and Royalists. In the Legislative Assembly they numbered only 162 out of a total of 745, and from conservative they became, in the course of time, reactionary. The Jacobins repeatedly impeached them before the Assembly; in December, 1791, they were compelled to abandon their meeting place in the Feuillants, and in August, 1792, the papers of the club were seized

and their members listed as suspects. It died peacefully.

FEUILLET, fẽ'yȧ', OCTAVE (1821–90). A popular French novelist and mediocre dramatist, born at Saint-Lô, Normandy, a favorite of the court and society of the Second Empire. He began his literary life as a collaborator of the elder Dumas, but presently deserted the romantic group and set up as a purveyor of novels and plays that should seem proper for general reading. His early dramas, such as *Le roman d'un jeune homme pauvre* (dramatized from his novel of the same name, in 1858), are fundamentally unhealthy growths of hothouse sentiment. His dramatic works (*Théâtre complet*) were collected in 5 vols. (1892–93). No novelist has painted so well the high-strung, neuropathic society woman, and in this he contributed an essential element to the growth of realism in fiction, although as a writer he stood midway between the romantic and the realistic schools. On the fall of the Empire he grew more sternly realistic in his treatment of the hard, selfish cynicism of the French upper class. It is curious to contrast in this regard *Monsieur de Camors* of 1867 with *Julia de Trécœur* of 1872, and this again with the *Histoire d'une parisienne* (1881) and *Les amours de Philippe* (1887). Consult L. Deries, *Octave Feuillet* (Saint-Lô, 1902).

FEUILLETON, fẽ'ye-tôɴ' (Fr., leaflet). A name given first to the literary portion of a French journal, usually occupying the lower third of the first page, "below the line" as it is technically called. The idea originated with the elder Bertin, editor of *Le Journal des Débats* (1800–41). The space was originally occupied, as it is often still, by criticisms, essays, and tales; but in the early thirties, first perhaps by Eugène Sue, the feuilleton began to be used for continued serial stories, often of portentous length. As each day demanded its copy, hasty production became the rule, unity of construction was sacrificed to the independent interest of each fragment, the attention of the reader was directed to details, and the whole suffered from the accentuation of its parts. This will account for the literary defects in such still popular novels as Dumas's *Monte Cristo* (Paris, 1845); Sue's *Le juif errant* (ib., 1845); and *Les mystéres de Paris* (ib., 1843). The greatest purveyors of feuilleton were the elder Dumas, Sue, Soulié, Souvestre, Karr, Bernard, Paul de Kock, and Janin. Their most popular successors have been Ponson du Terrail, Xavier de Montépin, and Jules Mary.

FÉVAL, fȧ'vȧl', PAUL HENRI CORENTIN (1817–87). A prolific French novelist, best remembered for his sensational *Mystèrcs de Londres* (11 vols., 1844), which rivaled for a time Sue's *Mystères de Paris* and was dramatized and several times translated. Among other novels dramatized with success the more noteworthy are *Le fils du diable* (1847), and *Le bossu*, with Sardou (1858). There are translations of other novels with the titles *The Lover of Paris* (1846), *The Duke's Motto* (1863), *The Woman of Mystery* (1864), and *Thrice Dead* (1869). Consult Ch. Buet, *Médaillons et Camées* (Paris, 1885).—His son, PAUL FÉVAL (1860–), followed his footsteps very creditably with *Nouvelles* (1890) and *Chantepie* (1896) as well as with several successful plays.

FE'VER (AS. *fefer*, OHG. *fiebar*, Ger. *Fieber*, from Lat. *febris*, fever, from *fevere*, to be hot). A rise in the body temperature attending most acute and some chronic diseases. The temperature is estimated according to the state of the internal parts rather than the external. The term "fever" is also applied to certain diseases in which high temperature is a prominent symptom, as typhoid fever, scarlet fever, yellow fever. Fever is a constant accompaniment of these diseases, as well as of pneumonia, which was formerly called lung fever. In most such diseases there is first a feeling of weakness, apathy, loss of appetite, and a chill, with pains in the body and limbs, and rapid pulse, constituting the period of *invasion*. Succeeding this comes the period of *domination*, during which the pulse remains rapid, the surface becomes flushed and hot, the temperature rises still higher; thirst, headache, restlessness, and rapid breathing exist; the skin is very dry, and the urine is scanty. During the *decline* of the fever the temperature falls, perspiration breaks out, the rate of respiration diminishes, pains cease, and the patient falls asleep. All fever is dependent upon a morbid process which is due partly to chemical changes which occur in the cells and partly to irritation of the nervous system by toxins produced by the disease. There are no "self-originating" or "spontaneous" or "idiopathic" fevers. Fevers are named according to prominent features, supposed or real causes, or localities in which they are commonly found. Thus, we have scarlet and yellow fevers, malarial fever, ship (or jail) fever, Malta fever, spotted fever, dengue (or dandy) fever, etc. If a fever is protracted for several days during which the temperature remains above the normal (98.6° F.), the type is called *continued;* if the temperature drops to be normal and rises again, after intermissions of a few hours, a day, or two days, the fever is called *intermittent;* if the temperature falls to a point above the normal and ascends again, oscillating in this way for several days, the fever is styled *remittent*. A certain fever decreases after several days till the temperature reaches the normal, and then after an interval of a few days it returns. This is styled *relapsing* fever. An intermittent (malarial) fever in which the intermission is one day, or two days, or three days, is respectively termed a quotidian, tertian, or quartan type. A rise of temperature due to fatigue, teething, or to vaccination, or a local heat due to an infected sore or a boil, is not called a fever, though probably with a larger knowledge of the pathological conditions of tissue during fever the name might be applied even to these cases.

In treating cases of fever it is customary to record at certain intervals each day the degree of temperature reached by the clinical thermometer, placed in the mouth or rectum of the patient. This record of temperature is plotted on a special chart, with lines connecting the points reached by the temperature, and the resulting diagram is called the "fever curve." For convenience' sake the rate of pulse and of respiration, morning and evening, is recorded on the chart as well as the defecation and urination in certain cases. For ardent fever, see HEAT STROKE; for autumnal fever, see TYPHOID FEVER; for ship fever, jail fever, or camp fever, see TYPHUS FEVER; for spotted fever, see MENINGITIS (paragraph *Cerebrospinal Meningitis*); for bilious fever (an improper term), see MALARIA and TYPHOID FEVER. Many other febrile disorders are described under their own names.

FEVER BLISTERS. See HERPES.

FEVER BUSH (so called as being sometimes used for intermittent fevers), *Lindera æstivalis*, or, as formerly known, *Benzoin odoriferum*. A shrub common in the northern United States, remarkable for its graceful form and beautiful leaves. It is from 4 to 15 feet high and grows best in moist and shady places. The bark is aromatic and tonic, and a decoction is used as a stimulant in fevers. The berries, which are bright scarlet in autumn, have occasionally been used as a substitute for allspice, and sometimes the shrub is called spicebush and wild allspice.

FE'VERFEW (AS. *feferfuge*, from Lat. *febrifugia*, century plant, from *febris*, fever + *fugare*, to put to flight, from *fugere*, to flee), *Chrysanthemum parthenium*. A perennial plant belonging to the Compositæ, found in waste places and near hedges in America and many parts of Europe. It is botanically allied to chamomile and still more nearly to wild chamomile (*Matricaria chamomilla*) and much resembles these plants in its properties, but differs in appearance, the segments of its leaves being flat and comparatively broad, and its flowers smaller. Its habit of growth is erect, its stem much branched and about 1 to 2 feet high. It has a strong, somewhat aromatic smell. It was once a popular remedy in ague and from time immemorial has been used as an emmenagogue. It is employed in infusion and is stimulant and tonic. A double variety is not uncommon in gardens. A related genus is the mayweed or dog fennel (*Anthemis cotula*), with leaves more resembling those of chamomile, but almost scentless, and large flowers, with white rays and yellow disk, very common in grain fields and waste places in America and throughout Europe. A form without the white rays is not uncommon.

FEVER TREE. See PINCKNEYA.

FEVERWORT (*fever* + *wort*, root, AS. *wyrt*, OHG. *wurz*, Ger. *Wurz;* connected with Lat. *radix*, root), HORSE GENTIAN, or WILD COFFEE, *Triosteum perfoliatum*. A perennial plant of the family Caprifoliaceæ. It has an erect, round, hairy, fistular stem, from 1 to 4 feet high, opposite ovate-lanceolate entire leaves, and axillary whorls of brownish-purple flowers. It is a native of North America, occurring in rich woods from Canada to Alabama and west to Iowa. Its dried and roasted berries have been occasionally used as a substitute for coffee; but it is chiefly valued for its medicinal properties, its root acting as an emetic and mild cathartic. It is sometimes called *Tinker's root*, being named after Dr. Tinker, who first brought it into notice.

FEWKES, fūks, JESSE WALTER (1850–). An American ethnologist, born at Newton, Mass. He graduated at Harvard in 1875, took his degree of Ph.D. there in 1877, and pursued the study of zoölogy at Leipzig (1878–80). He was an assistant at the Museum of Comparative Zoölogy, Harvard, from 1881 to 1889, and secretary of the Boston Society of Natural History from 1889 to 1891, and edited the *Journal of Ethnology and Archæology* from 1890 to 1894. He directed the Smithsonian archæological expedition to Arizona, and in 1895 became an ethnologist in the Bureau of American Ethnology. He was in charge of the excavation and repairs of Casa Grande, Ariz., and of Spruce Tree House, Cliff Palace, Colo. (1908–09). His writings comprise pamphlets on marine zoölogy and American archæology and ethnology, including a report on the ceremonies of the Moqui Indians.

FEYDEAU, fā'dō', ERNEST AIMÉ (1821–73). A French sensational novelist, a mediocre dramatist, and an antiquarian scholar of some distinction, born in Paris. In 1858 he sprang into notoriety with *Fanny*, a daringly realistic study of the psychology of jealousy, to be associated with Constant's *Adolphe*. He wrote also an unfinished *Histoire des usages funèbres et des sépultures des peuples anciens* (1857–61); *Le secret du bonheur* (1864; trans., 1867); sketches of Algerian life; *L'Allemagne en 1871* (1872), a clever but bitter view of Germany; and a splendid life of *Théophile Gauthier*. Consult Barbey d'Aurevilly, *Les Œuvres et les hommes au XIXe siècle* (6 vols., Paris, 1892–99).—His son, GEORGES FEYDEAU (1862–), became known as a brilliant writer of monologues and witty one-act plays.

FEYEN-PERRIN, fe-yäN'-pe-räN', FRANÇOIS NICOLAS AUGUSTIN (1826–88). A French genre painter, born at Nancy (Meurthe). He studied under Yvon and Cogniet at the Ecole des Beaux-Arts. A very versatile artist, he chose his subjects from everyday life, such as "A Lesson in Anatomy" (1864, Tours Museum), from history, as "The Finding of the Body of Charles the Bold," and from literature, especially Dante. He also painted studies of the nude, but his series of Breton pictures show him at his best. He has rendered the atmosphere of the sea with fine effect; but his figures, especially his women, are too pretty and elegant for hard-working peasants. Among the most popular of these studies are "Return of the Oyster Fishers" (1874; Luxembourg); "The Winnower" (1867); "Return from Fishing at Low Tide." He received medals at the salons of 1865 and 1874 and the Legion of Honor in 1881.

FEYJÓO Y MONTENEGRO, fā'ē-hō'ō ē mōn'tā-nā'grō, BENITO JERÓNIMO (1676–1764). A Spanish monk, critic, and scholar, born at Casdemiro, a small hamlet in the District of Santa María de Melias, near Orense. He entered the Benedictine Order and lived all his life at one of the monasteries of the order at Oviedo, where he died. He studied not only religion, but mathematics, philosophy, and medicine, and was almost the first to appreciate how far Spain was behind other European countries in these matters. Feyjóo's works included the *Teatro crítico universal para desengaña de errores comunes* (1726–39), which appeared in eight volumes. The *Teatro crítico* has been compared to Addison's *Spectator*, but it is of a weightier quality. Feyjóo wrote about the position of women; the manners of the clergy; the scientific discoveries of Galileo, Bacon, Pascal, and Newton; popular fallacies concerning comets and eclipses; and other matters. In 1739 he ceased to publish the *Teatro crítico*. In 1742 he began *Cartas eruditas y curiosas* (1742–60), which continued the leavening process begun by the other. His complete works were published in Madrid (1780). Despite his obvious faults of style and a general lack of genius, and although he made no great discovery, it would be difficult to exaggerate the importance of his influence in awakening Spain to a realization of her situation and arousing her to interest in educational matters.

FEZ. One of the capitals and the chief city of Morocco, situated about 100 miles south of the Strait of Gibraltar in a valley surrounded by high hills (Map: Africa, D 1). The city lies on both banks of the Wad Fas, a tributary of the Wad Sebu, which divides it into the two parts of Fez el-Bali, the old town, and Fez el-Jedid. It is a very ill-built town, with narrow, filthy streets, with no sanitary arrangements, which, together with a humid climate and an inadequate water supply, make it unhealthful. The streets are, however, occasionally washed by closing the ordinary exits of the conduits and opening lids which permit the river water to flow into the streets and carry off the accumulated refuse. In its flourishing days Fez had about 90,000 dwelling houses and 800 mosques. Of the latter only about 100 are left. Of these the most important are Muley-Edris, containing the tomb of Edris II (the reputed founder of Fez), and Jama-Karubin, to which is attached one of the highest educational institutions of the Mohammedan world, and which contains a large library of Arabian works on theology. Fez has also a number of minor schools and is still regarded as an important educational centre. The industries are considerable, the products including leather, rugs, shawls of silk, and the red "fez" caps. It was formerly the chief place of manufacture of the red fez cap, the color of which was produced from a dye made from the juice of a berry grown in that vicinity, but the same shade is now produced elsewhere. In point of commerce Fez is the most important city of northwestern Africa. It is the distributing centre for European products from Marseilles and London, while its caravans travel as far as Timbuktu. The population of Fez, formerly about 400,000, is now estimated at 100,000, consisting chiefly of Moors, and with some Arabs, Berbers, and about 10,000 Jews. The foundation of Fez is usually believed to have taken place at the end of the eighth century (793) and is attributed to Edris II. The city was held in high veneration by the Mohammedans and attracted numerous pilgrims. In the thirteenth century it became the capital of an independent state, when it prospered greatly. In the middle of the sixteenth century it passed to Morocco, and since then it has gradually declined.

FEZ. A red brimless felt or wool cap, fitting closely to the head, ornamented with a long tassel, worn in Turkey, Persia, Greece, Albania, Egypt, and on the shores of the Levant generally, and designating a Turkish subject, even if not a Mussulman. This cap has long been the Turkish national headdress. The name was derived from the town of Fez in Morocco, where such caps were first made. In Africa it is called also *tarbûsh*.

FEZZAN, fĕz-zän′. A political division of the Italian Province of Tripoli (q.v.) in north Africa. Prior to the annexation of Tripoli by Italy in 1912 it was a lieutenant governorship of the Turkish Vilayet of Tripoli (Map: Africa, F 2). It is an extensive group of oases occupying the southern portion of the vilayet, with a total area of about 156,000 square miles. The greater portion of the surface consists of hills of black quartz sandstone, among which the most prominent are the Jebel-es-Soda, or Black Mountains, running from east to west for a distance of about 170 miles and not exceeding 3000 feet in altitude. The northwestern part of the country is an elevated waterless plateau known as Hammada-el-Homra, while the southern portion is a desert. The rivers are insignificant, and vegetation is found mainly along the wadies, or dried-up river courses, where also are located the chief centres of population. The chief of these wadies are the Shati, lying between lat. 27° and 28° N., and the Sherki, situated south of the Shati, the centre of the most fertile section of Fezzan. The climate is hot and dry in the summer and cold in the winter. Not more than a tenth of the area is cultivable. In the neighborhood of the villages, which are situated mainly in the wadies, wheat, barley, etc., are grown partly with the aid of artificial irrigation. The date is the principal article of food. Large numbers of camels and horses are raised. The population is estimated at a little over 70,000. The inhabitants are a mixed race, of a brown color, generally well formed, and in many respects resembling the negro. The original inhabitants belonged to the Berber family, but since the invasion of the country by the Arabs the traces of this native north African element have gradually disappeared. The chief elements in the population are Tuaregs, Arabs, Moors, and negroes. The language spoken is a corrupt mixture of Berber and Arabic. The capital is Murzuk (q.v.). Fezzan is the Phazania of the ancients, and was conquered in 19 B.C. by the Romans under the proconsul L. Cornelius Balbus. Christianity was introduced at the end of the sixth century, but with the conquest of the territory by the Arabs at the end of the seventh century Mohammedanism took its place. The territory was governed by its own princes under the suzerainty of the Arabs and subsequently became a tributary state of Tripoli. With the extinction of its dynasty of rulers, Fezzan became, after a period of internal uprisings and usurpations, a dependency of Tripoli. On the annexation of Tripoli by Italy in 1912 Fezzan was considered a part of that territory, and portions of its area were occupied by the Italian army in 1913 without serious opposition on the part of the inhabitants.

FIACRE, fyȧ′kr′, or **FIACHRACH**, SAINT (?–c.670). A monk of France in the seventh century. He was born of noble parents in Ireland. He became an anchorite and then left his native country with some companions for France. They were kindly received by Faro, Bishop of Meaux, who gave him a residence in the forest of Breuil, in Brie, the region south of Meaux, where Fiacre built a cell and gave asylum to such strangers as fell in his way. Many stories were told of his miracles, and after his death his shrine had the reputation of working miracles, and pilgrimages to it began. His festival day is August 30. St. Fiacre is the patron saint of gardeners. The proprietor of the Hôtel de Saint-Fiacre, in the Rue Saint-Martin, Paris, opened the first livery stable in Paris in 1640. A statue of the saint stood over the door, and this circumstance gave the name *fiacre* to a public carriage in France.

FIALA, fē-ä′lȧ, ANTHONY (1869–). An American Arctic explorer, born in Jersey City, N. J., and educated at Cooper Union and the National Academy of Design, New York City. In early life he was engaged in various employments—as lithographic designer, chemist, cartoonist, head of the art and engraving department of the Brooklyn *Daily Eagle* (1894–99), and correspondent for that paper while serving as a trooper in the Spanish-American War. In 1901–02 he accompanied the Baldwin-Ziegler polar expedition as photographer; in 1903–05 he was in command of the expedition sent out by Ziegler from Tromsö in July, 1903. The party reached 82° 4′ N., and surveyed the Franz Joseph Archipelago, but lost their ship, *America*, in Teplitz Bay and failed to reach the pole. A relief party sent out under William S. Champ found Fiala and his men at Cape Dillon in July, 1905, and brought them home. In 1914 Fiala accompanied Theodore Roosevelt on his expedition into hitherto unexplored parts of Brazil. He wrote *Troop "C" in Service* (1899) and *Fighting the Polar Ice* (1906).

FIALIN, J. G. V. See PERSIGNY, DUC DE.

FIAMMETTA, fyȧm-mĕt′tȧ. The name given by Boccaccio to his ladylove, believed to be Maria, daughter of Robert, King of Naples.

FIAMMINGO, PIETRO. See VERSCHAFFELT.

FIAS′CO (a flask or bottle). A term borrowed from the Italian theatre, signifying a failure to please on the part of an actor or singer. The word has been extended to cover any ignominious failure or disappointment. Its application, however, is not quite clear.

FI′AT (Lat., let it be). In English legal procedure, an indorsement of a judge, master, or registrar upon an application for an order or rule, which serves in lieu of a formal order. The purposes for which it may be employed are strictly limited, and it is chargeable with a smaller fee than an order which is drawn up in due form. The term is also applied to the formal leave of the Attorney-General to take certain proceedings, indorsed upon an application. It is best known in connection with bankruptcy proceedings, the order of the court directing that a commission in bankruptcy issue having long been known as a "fiat in bankruptcy." Its use in this sense has, however, been abolished by statute.

FI′AT MONEY. Inconvertible paper money, not even containing a promise to pay, but issued by the state with the bare assertion of its identity with true money, although no provision is made for its exchange for specie. Fiat money was issued by the American Colonies to a considerable extent, and the history of its rapid depreciation and final worthlessness is well known. When a government is forced to this measure, the state of its finances is virtually bankruptcy. The name "fiat money" was first given to irredeemable paper currency during the Greenback agitation in the United States after the Civil War, from the claim of the Greenback party that the *fiat* of the government could give value to a circulating medium.

FIBICH, fē′bĭk, ZDENKO (1850–1900). A Bohemian composer. He was born at Všebořic, near Czáslau, Dec. 21, 1850. His musical talent showed itself very early, so that even before his fourteenth year, and before having taken up music as a serious study, he wrote a symphony. From 1865 to 1867 he studied at the conservatory in Leipzig under Moscheles, Richter, and Jadassohn, and also came strongly under the influence of Schumann's music. After a year in Paris he went to Mannheim in 1869 and studied a year with Vincent Lachner. Returning to his native country, he established himself as a teacher at Wilna, until in 1876 he became conductor at the National Theatre in Prague, which post he resigned in 1878 to accept the position of chorus master of the Russian church in the same city. In 1881 he also gave up this place in order to devote his entire time to composition. He died in Prague, Oct. 10, 1900. Among the Czech composers Fibich occupies a foremost place, being surpassed only by Smetana and Dvořák. The number of his works reaches 700, many in large forms. Among the more important are the operas *Bukovín* (1874), *Blaník* (1881), *Die Braut von Messina* (1884), the melodramatic trilogy *Hippodamia* (1891), *The Tempest* (1895), *Sárka* (1898), *Der Fall Arconas* (1900); four symphonies in G minor, F, E♭, and E minor, the symphonic poems *Othello*, *Toman and the Nymph*, *Vesna*, *Zaboj*, *Slavoj and Luděk*, *Vigiliæ;* several overtures and choral works with orchestra; chamber music; about 400 pieces for piano, and a large number of songs. Consult C. L. Richter, *Zdenko Fibich* (Prague, 1899).

FIBIGER, fē′bĭ-gẽr, JOHANNES HENRIK TAUBER (1821–97). A Danish divine and poet, born at Nykjöbing on the island of Falster. His poetic works include: *Johannes den Döber*, a biblical drama (1857); *Kors og Kjærlighed*, a tragedy of domestic life (1858); *Nogle Sagn*, stories in verse (1865); *Den evige Strid*, a tragedy (1878), quite popular; *Graabröderen*, a narrative in 16 cantos (1882); and a collection of poems (1884); His autobiography appeared in 1898.

FIBONACCI, fē′bō-nä′chē, LEONARDO, called LEONARDO PISANO. One of the greatest mathematicians of the Middle Ages. He flourished at the opening of the thirteenth century, but little is known of his personal life. He early acquired a love for mathematics and science and perfected his knowledge on his journeys to the Barbary coast, Egypt, Syria, Greece, and Sicily. Following are his chief works: *Liber Abaci*, composed in 1202, of which only a second edition is extant; *Practica Geometriæ; Liber Quadratorum; Flos*, treating of the cubic equation; a letter to Theodorus, philosopher to the Emperor, relating to indeterminate analysis and to geometry. Fibonacci's name attaches to a certain series, important in the theory of numbers, viz., 0, 1, 1, 2, 3, 5, 8, 13 . . . , in which $u_{n+2} = u_{n+1} + u_n$. This series has many interesting properties; e.g., (1) the sum of the first $n + 1$ terms, u_0, u_1, u_2, . . . u_n increased by 1, equals u_{n+2}; (2) the square of any term is one unit less than the product of the two adjacent to it. The works of Fibonacci were published by Prince Boncompagni (2 vols., Rome, 1857–62). Consult: Lucas, *Recherches sur plusieurs ouvrages de Léonard de Pise et sur diverses questions d'arithmétique supérieure* (ib., 1877); Bonaini, *Memoria unica sincrona di Leonardo Fibonacci* (Pisa, 1858) and *Iscrizione collocata nell' archivio di stato in Pisa a onore di Leonardo Fibonacci* (ib., 1867); Milanesi, *Documenti inedito e sconosciuto intorno a L. Fibonacci* (Rome, 1867); Boncompagni, *Intorno ed alcune opere di Leonardo Fibonacci* (ib., 1854).

FI′BRE (Lat. *fibra*, filament). A term of very common use as applied to objects of a stringy or threadlike character, whether of the animal, vegetable, or mineral kingdom. Minerals are often described as of a fibrous structure or appearance, in which there is, however, no possibility of detaching the apparent fibres from the general mass, or in which they are inflexible, and brittle if detached; but a more perfect example of mineral fibre is found in amiantus, a variety of asbestos. For the scientific use of the term "fibre" with regard to the animal kingdom, see the article MUSCLE AND MUSCULAR TISSUE; for its scientific use with regard to the vegetable kingdom, see VEGETABLE TISSUE; WOOD. In its more popular but perfectly accurate use it includes the hair or wool of quadrupeds, the silken threads of the cocoons of silkworms and other insects, the fibres of the leaves and of the inner bark of plants, and the elongated cells or hairs connected with the seeds of plants, the ordinary materials of cordage, and of textile fabrics.

Of mineral substances, amiantus alone has been used for textile fabrics, and that only to a very limited extent. Animal and vegetable fibres have, from the earliest ages, supplied man with cordage and with cloth. How the invention took place can only be matter of conjecture. It is noted as an interesting fact that the most valuable commercial fibres of to-day were the prominent fibres of ancient times. Cotton, flax, hemp, as well as the common animal fibres, as hair, wool, and silk, were known and used in past ages.

The animal fibres used for textile purposes are chiefly of the two classes already mentioned, (1) the wool or hair of quadrupeds and (2) the silk of the cocoons of insects. To these may be added (3) the byssus of mollusks, but this class contains only the byssus of the pinna (q.v.) of the Mediterranean, an article of ancient and high reputation, but more of curiosity than of use. The skins and intestines of animals, although sometimes twisted or plaited for various uses, can scarcely be reckoned among the fibrous materials afforded by the animal kingdom. For information regarding the fibres obtained from the cocoons of insects, see SILK; SILKWORM. It is to the first class that the greater number of different kinds of animal fibres used for textile purposes belong; and the wool of the sheep far exceeds all the rest in importance. But the wool or hair of other quadrupeds is also to some extent used, as that of the goat, the alpaca, the camel, the musk ox, and the yak, all of which are, like the sheep, ruminants. The hair of comparatively few animals is sufficiently long for textile purposes or can be procured in sufficient abundance to make it of economic importance. The warmth of clothing depends much on the fineness of the hair, and on other characters in which wool particularly excels. See SHEEP; WOOL; GOAT; ANGORA; ALPACA; CAMEL; MUSK OX; YAK.

The useful vegetable fibres are far more numerous and various than are the animal. They are obtained from plants of natural orders very different from each other. They are obtained also from different parts of plants. Wood cells are found in the bark, and are longer, finer, and tougher than those found in the wood. They form the principal part of the fibrous bark or bast layer of cells. These give toughness and flexibility to the structure, and the extracted bundles of cells form the filamentous product known as flax, hemp, and jute, derived from dicotyledonous plants. In monocotyledons the fibrous cells are built up with others into a composite structure known as fibrovascular bundles. Such fibre occurs in the palms and in the fleshy-leaved agaves, the bundles being found, not as in bark, but throughout the stem or leaf forming the supporting structure. These filaments, when separated from the soft cell mass by which they are surrounded, may be known as structural fibre, of which the fibre of sisal hemp is an example. The simple cells produced on the surfaces of the seeds of endogens, such as cotton and coconut, constitute a fibrous material, to which the name "surface fibre" has been given. For illustrations, see Plate of FIBRE PLANTS under article HEMP.

The fibre bundles, therefore, whether occurring as bast fibre or structural fibre, or whether in the form of simple cells, as surface fibre, may be regarded as the spinning units—aggregations of bundles purified and cleansed of all extraneous matter and simply twisted together. The mass of cellular structures separating the fibres is removed in the process of cleaning. The fibres of the leaves of endogens, being parallel to each other, are easily obtained of sufficient length for economical purposes; while the reticulated fibres of leaves of exogens, even if long enough, which is comparatively seldom the case, cannot be separated for use. The best fibres of exogens, however, are often of sufficient length and easily separated. The separation is generally accomplished by steeping in water or by frequent dampening with water so as to cause a partial rotting of the other parts of the bast and of the bark which covers it. Since the fibres of endogens are in general discolored and injured by this damp process to a much greater degree than are those of exogens, mere mechanical means are usually preferred for their separation, such as beating, passing between rollers, and scraping. The fibres of many leaves are separated by scraping alone. The fibres of seeds, as cotton, exist in nature attached to the seed, like the wool or hair of animals, and require merely to be collected and cleaned.

A method of separating animal and vegetable fibres in woven materials is based upon the fact that alkalies destroy the former, and have little effect upon the latter. The alkali used is generally caustic potash of 5 per cent strength. If a wool-cotton or a silk-cotton mixture is boiled in this solution for about 15 minutes, the wool or silk is destroyed and the cotton is little affected. The test may be made quantitative. The most accurate results are obtained by removing dressing or finishing substances from the material before applying the test.

There are two natural groups of fibres—the commercial species and the vast group of the so-called native fibres. Among the uncivilized races many species of fibre plants which civilized man cannot afford to employ commercially have become most useful for utensils, cords, and clothing. While 30 or 40 species of plants supply the world's demand for commercial fibres, hundreds of fibrous plants could readily be enumerated. The list of commercial fibres may be increased from time to time. Of those now important there are six bast fibres, as follows: Flax (*Linum usitatissimum*); China grass (*Bœhmeria nivea*); hemp (*Cannabis sativa*); jute (*Corchorus capsularis* and *Corchorus olitorius*); Sunn hemp (*Crotalaria juncea*); and Cuba bast (*Hibiscus tiliaceus*). There are two surface fibres: Cotton (*Gossypium* spp.) and raffia (*Raphia pedunculata*). The list of structural fibres numbers 15, representing agaves, palms, and grasses as follows: *Cordage fibres*—Sisal hemp (*Agave rigida* var.); Manila hemp (*Musa textilis*); Mauritius flax (*Furcræa gigantea*); New Zealand flax (*Phormium tenax*). *Brush fibres*—Tampico or istle (*Agave* *heretacantha*); Bahia piassaba (*Attalea funifera*); Para piassaba (*Leopoldinia piassaba*); Mexican whisk, or broom root (*Epicampes macroura*); cabbage palmetto (*Sabal palmetto*). *Upholstering and matting fibres*—Crin végétal (*Chamærops humilis*); Spanish moss (*Tillandsia usneoides*); saw palmetto (*Serenoa serrulata*); coconut fibre (*Cocos nucifera*). *Paper manufacture*—Esparto grass (*Stipa tenacissima*), a substitute for bath sponges; and vegetable sponge (*Luffa ægyptica*).

The sources of supply of these fibres are as follows: Flax is produced chiefly in Belgium, Russia, Austria-Hungary, Holland, Italy, Great Britain and Ireland, the United States, and Canada; China grass, or ramie, comes from China; hemp is obtained from Russia, United States, France, Belgium, Germany, Austria-Hungary, Italy, and the Netherlands; jute from India and Cuba; bast from the West Indies; cotton is chiefly produced in the United States, Egypt, and Peru; raffia comes from Africa; sisal hemp is produced in Yucatan, Cuba, and the Bahamas; Manila hemp is a product of the Philippine Islands; Mauritius, or aloe, fibre comes from Africa; New Zealand flax from the country indicated by its name; Tampico, or istle, is a Mexican product; Bahia or Pará piassabas, or "bass" fibres, are collected from Brazilian palms, other species of bass from African palms; broom root is a Mexican product; the two palmetto fibres are produced from species of Florida palms; crin végétal is derived from an allied palm, growing in Algeria; vegetable hair from Spanish moss is prepared in South Carolina and the Gulf States; coconut fibre comes from the East Indies; esparto grass is produced in Algeria, Spain, and Portugal; vegetable sponge largely in Japan. Other fibrous substances appear in the form of straw plait from Italy, Japan, and China chiefly. The Eastern floor mattings and basketry are made from various fibres.

The highest use for which fibre may be employed is in the manufacture of cloth or woven fabric. The next higher uses are in the manufacture of threads, twines, cords, and ropes known as cordage. A third use is in the manufacture of brushes and brooms, for which a different class of fibre than either the fabric or cordage fibres is employed. Fourth, fibres are used in the manufacture of many plaited or coarsely woven articles employed in domestic economy, some of which are of commercial importance, while the greater number are "native" productions. A fifth form of utility is the employment of fibres or fibrous substances in mass as filling material, for stuffing pillows, cushions, mattresses, furniture, etc., or as packing substances. A sixth and exceedingly important use is in the manufacture of paper. For further information, consult: Watt, *Dictionary of Economic Products of India* (Calcutta, 1889); Morris, *Commercial Fibres* (London, 1895); "Vegetable Fibres," *Kew Royal Gardens* (ib., 1898); Dodge, "Useful Fibre Plants of the World," *United States Department of Agriculture, Fibre Investigations, Report No. IX* (Washington, 1897); Georgievics, *Chemical Technology of Textile Fibres* (New York, 1902); Matthews, *Textile Fibres* (3d ed., ib., 1913); Mitchell and Prideaux, *Fibres Used in Textiles and Allied Industries* (ib., 1911). See FLAX; JUTE; RAMIE.

FI'BRIN (from Lat. *fibra*, fibre). A proteid substance somewhat similar to myosin and globulin (see GLOBULINS), from which it may be readily distinguished by its insolubility in dilute acids and alkalies as well as in dilute solutions of common salt. By the action of pepsin or of trypsin fibrin is converted into certain forms of globulin. Fibrin may be obtained from blood by beating or stirring with a bundle of twigs, to which the fibrin adheres in strings. The impure substance thus obtained is rinsed with water and may be boiled with alcohol and ether, to remove fatty matters. The properties of fibrin depend to some extent on the manner in which this method of preparation is carried out, and Denis succeeded in obtaining three distinctly different forms of fibrin. Fibrin has the peculiar property of decomposing peroxide of hydrogen without itself undergoing any chemical change.

FIBRIN'OGEN. See GLOBULINS.

FI'BROLITE. A variety of sillimanite, noted for its fibrous structure. The name was formerly used to denote the entire species.

FIBRO'MA. See TUMOR.

FI'BROSARCO'MA. See TUMOR.

FI'BROVAS'CULAR BUNDLE (*fibro-*, from Lat. *fibra*, fibre + *vascular*, from Lat. *vasculum*, little vessel, dim. of *vas*, vessel). A strand of conducting tissue in ferns and seed plants, which are therefore called vascular plants. The bundle usually comprises both wood (xylem) and bast (phloem) in various relations to each other. The term "fibrovascular" was given because there are usually some fibres associated with the vessels; but now the bundles are called simply vascular bundles, because the fibres referred to are of different origin and are not characteristic. See MORPHOLOGY OF PLANTS; FIBRE.

FIB'ULA. See LEG.

FIBULA. The name given by the Romans to the brooch. See FIBULA PRÆNESTINA.

FIBULA PRÆ'NESTI'NA (Lat., Prænestine brooch). A gold brooch found in 1886 at Præneste. It bears a retrograde inscription in Old Italic characters, which is the oldest extant specimen of Latin, dating probably from the sixth century B.C., and which is important as showing *fh* for *f*, *s* for later *r* between vowels, the reduplicated perfect, the use of the dative singular ending *-oi* and the early use of the accusative ending *-d*. The inscription reads: MANIOS MED FHEFHAKED NUMASIOI, which is equivalent to classical Latin *Manius me fecit Numasio* or *Numario* (Manius made me for Numasius *or* Numarius). Consult *Corpus Inscriptionum Latinarum*, xiv, 4123 (Berlin, 1887), and Egbert, *Latin Inscriptions* (New York, 1896).

FICHEL, fē'shĕl', EUGÈNE (1826–95). A French genre painter, born in Paris. He was a pupil of Paul Delaroche and at first painted historical subjects, such as "Harvey Demonstrating the Circulation of the Blood to Charles I" (1850). He subsequently adopted the miniature style of Meissonier with its great care in finish and archæological exactness, combining with it a kind of delicate humor. Among his numerous works are: "The Arrival at the Inn" (1863); "The End of Dinner" (1872); "The Council of War" (1890); "The Breakfast" (Lille Museum); "Amateurs Visiting a Painter" (Grenoble); "The Chess Players," and "The Encyclopædists" (Amsterdam).

FICHET, fē'shā', GUILLAUME. A French scholar of the fifteenth century. In 1467 he was elected rector of the University of Paris, and he installed in the Sorbonne the first printing press ever set up in France, with the aid of three printers who came from Mainz to assist him in this work. The first book printed was *Lettres de Gasparino* (1470). Some of Fichet's own books followed, such as *Ficheti Guillelmi Artium et Theologiæ Doctoris, Rhetoricorum Libri III* (1470), and *Ficheti Guillelmi Epistolæ* (1471). Consult Phillipe, *Guillaume Fichet, sa vie et ses œuvres: Introduction de l'imprimerie à Paris* (Annecy, 1892).

FICHTE, fĭk'te, IMMANUEL HERMANN VON (1797-1879). A German philosopher, son of Johann Gottlieb Fichte. He early devoted himself to philosophical studies, being attracted by the later views of his father, which he considered essentially theistic. He also attended the lectures of Hegel, but felt averse to what he deemed to be his pantheistic tendencies. Occupied at first as a teacher, Fichte was appointed professor of philosophy in Bonn in 1836, and from 1842 to 1867 held a chair in the University of Tübingen. The most important of his many works are: *Beiträge zur Charakteristik der neuern Philosophie* (1829; 2d ed., 1841); *System der Ethik* (1850-53); *Anthropologie* (1856); *Die theistische Weltansicht und ihre Berechtigung* (1873). The great aim of his speculations was to find a philosophic basis for the personality of God, and for his theory on this subject he proposed the term "concrete theism." The regeneration of Christianity, according to him, would consist in its becoming the vital and organizing power in the state, instead of being occupied solely, as heretofore, with the salvation of individuals. Consult Scherer, *Die Gotteslehre von I. H. Fichte* (Wien, 1897), and a centennial article by Eucken in 1897 in the journal Fichte had founded in 1837, *Zeitschrift für Philosophie.*

FICHTE, JOHANN GOTTLIEB (1762-1814). An illustrious German philosopher. He was born, the son of a ribbon weaver, at Rammenau, in Upper Lusatia, May 19, 1762. As a lad of promise, he attracted the attention of a neighboring nobleman, Baron von Miltitz, who assisted him in his early education. In 1780 he entered the University of Jena, where, as subsequently at Leipzig, he studied theology and philosophy, supporting himself by tutoring. During the years 1784 to 1788 he acted as tutor in various Saxon families. From 1788 to 1790 he taught in private families at Zurich, where he became acquainted with Pestalozzi. He then returned to Leipzig and in 1791 obtained a tutorship at Warsaw, in the house of a Polish nobleman. The situation, however, proved disagreeable, and the philosopher next proceeded to Königsberg, where he had an interview with Kant, of whom he had become an ardent disciple. He submitted his *Versuch einer Kritik aller Offenbarung* (A Tentative Critique of all Revelation) to that philosopher, who praised it highly and advised him to publish it. The following year it appeared anonymously and was credited to Kant, who then made known its authorship. This incident established Fichte's fame as a philosopher. In 1793 he married Johanna Maria Rahn, a niece of Lavater, and the following year he was appointed to the chair of philosophy at Jena, where he began to expound with extraordinary zeal his system of "transcendental idealism." In 1795 he published *Ueber den Begriff der Wissenschaftslehre* (Concerning the Idea of the Theory of Science), and followed it almost immediately with *Grundlage und Umriss der gesammten Wissenschaftslehre* (Foundation and Outline of the Entire Theory of Science), in which he clearly broke away from Kant, whose speculations did not seem to him sufficiently thorough. In 1796 he published *Grundlage des Naturrechts* (Foundation of Natural Law); in 1798, *System der Sittenlehre* (System of Ethics), and in the same year an article in a philosophical journal, which cost him dear. It was entitled "Ueber den Grund unsers Glaubens an eine göttliche Weltregierung" (The Basis of Our Belief in a Divine Government of the World). For views therein expressed he was charged with atheism, inasmuch as he had characterized God as the moral order of the world. In vain did he deny the atheistic nature of this doctrine; the *odium theologicum* was too strong for him, and he was compelled to relinquish his chair. The feeling against him had extended far beyond the Grand Duchy of Saxe Weimar. Indeed, Prussia was the only German state that had not joined in demanding his resignation from Jena. Accordingly Fichte went in 1799 to Berlin, where he delivered lectures to audiences composed of men of distinction, and where he made friends of such men as Schlegel, Schleiermacher, and Tieck. In 1805 he was appointed to a professorship in Erlangen. The approach of the French army drove him in 1806 to Königsberg, and in 1807-08 he delivered his famous "Addresses to the German Nation" (Reden an die deutsche Nation) in Berlin. These addresses were full of the most exalted enthusiasm. The Prussian King appreciated the zeal of the eloquent metaphysician, and on the restoration of peace appointed him to a professorship in the newly founded University of Berlin. In 1810 the university was opened with a host of brilliant names—Fichte, Friedrich August Wolf, Wilhelm von Humboldt, De Wette, Schleiermacher, and Savigny. By the votes of his colleagues Fichte was unanimously elected rector. In 1813 the War of Liberation broke out, and the hospitals of the Prussian capital were soon crowded with patients. Fichte's wife was one of the first to offer her services as a nurse. For five months she tended the sick with all the patient tenderness and devotion of her nature. At last she was seized with typhoid fever, and after a fearful struggle she recovered; but her husband caught the infection, and died Jan. 27, 1814.

The fundamental notion of the idealism set forth in Fichte's writings, at least in the earlier of them, is the sole reality of the conscious self or ego, which gives rise by its activity to the not-self or non-ego, inasmuch as self-knowledge is possible only in contrast with knowledge of a non-ego. The significance of this view in the history of philosophy can be understood only by comparing it with Kant's (q.v), from which it was developed. Kant had taught that experience arose from the concurrent action of sensation and thought, sensation being the product of things in themselves as they affect the mind, while thought is the spontaneous activity of the conscious self. Thus, experience for Kant is dualistic. This dualism is what Fichte sought to overcome, and he set about it by denying that the sense element in experience is traceable to the action of objects independent of the percipient subject. The non-ego is the creation of the ego. This creation is not accomplished at the instigation of some external stimulus. It is an original, uncaused, free activity of the self. The first result of this activity is sensation. The act of giving rise spontaneously to sensation is an unconscious act; its effect is the first object of consciousness. Because the act is unconscious, its result seems to be obtruded upon consciousness from without, a well-known characteristic of sensation. Why does the self create a sense object? In order to give free play to its activity. It sets up an object as a limit only to transcend this limit. This is done in the successive stages of knowledge, beginning with perception and ending with the categorical imperative, which is the termination of the process, because at this point the self is conscious of *itself* (not of some apparently alien obtrusion), as *giving to itself* all its determinations. The ego, in so so far as it is determined by knowledge, is the intelligent ego, and, as such, the subject of theoretical science; the ego, on the other hand, as determining the non-ego, is the subject of practical science. To recapitulate, Fichte makes that which, from the standpoint of ordinary consciousness, we call the world, merely a product of the ego; it exists only through the ego, for the ego, and in the ego. The ego, however, is not held by Fichte to be the phenomenal self —i.e., the limited temporal self which each person takes himself to be. On the contrary, the creative ego is a universal self common to all finite selves. Abstraction must be made from the finitude of our individual selves, for finitude is itself a self-imposed limit to be transcended. The universal self thus reached is God. A popular exposition of his philosophy is given in his *Anweisung zum seligen Leben*. It is set forth in a strictly scientific manner in the lectures published in the *Nachgelassene Werke*, edited by I. H. Fichte (3 vols., Bonn, 1834–35), in which his *Speculative Logik* and his revised theory of law and morals are particularly deserving of attention. Although Fichte never, strictly speaking, formed a school, and although his system has been adopted only by a few, such as J. B. Schad, Mehmel, Cramer, Schmidt, and Michaelis, his influence upon the subsequent development of German philosophy has been very important, especially through the influence he exerted upon Hegel (q.v.). But of recent years there is a tendency among many idealists to go back to Fichte, discarding Hegel's dialectic. Of this tendency Münsterberg (q.v.) is the best-known representative in America. Fichte's collected works were published by his son, I. H. Fichte (1845–46). His popular works have been translated into English. Their titles are: *The Destination of Man; The Vocation of the Scholar; The Way to the Blessed Life; The Characteristics of the Present Age; Outlines of the Doctrine of Knowledge.* A. E. Kroeger translated: *The Science of Knowledge* (1889); *The Science of Rights* (1869: 2d ed., 1889); *The Science of Ethics as Based on the Science of Knowledge* (1897). Some of the shorter works have appeared in translations from time to time in the *Journal of Speculative Philosophy*. Consult: Kuno Fischer, *Geschichte der neuern Philosophie*, vol. v (Heidelberg, 1897 et seq.); id., *Fichte's Leben, Werke und Lehre* (ib., 1900); Adamson, *Fichte* (London, 1881); Everett, *Fichte's Science of Knowledge: A Critical Exposition* (Chicago, 1884); Carrière, *Fichte's Geistesentwickelung u. s. w.* (München, 1894); Schneider, *Johann Gottlieb Fichte als Socialpolitiker* (Halle, 1894); Lindau, *Fichte und der neuere Socialismus* (Berlin, 1900); Weber, *Fichte's Socialismus und sein Verhältnis zur marxschen Doktrin* (Tübingen, 1900); Léon, *La philosophie de Fichte* (Paris, 1902); Gutman, *Fichte's Sozialpädagogik* (Bern, 1907); and the leading histories of philosophy, such as Erdmann's, Ueberweg-Heinze's, Windelband's, and Falckenberg's.

FICHTELGEBIRGE, fĭK'tel-ge-bēr'ge (Ger., Fir Mountains). A mountain range of Germany, situated in Upper Franconia, Bavaria (Map: Germany, D 3). It occupies a central position between the northwest-southeast ranges of the Thüringer Wald, Franken Wald, and Böhmer Wald, and the ranges of the Franconian Jura, Elstergebirge, and Erzgebirge, which have a northeast-southwest trend. The Fichtelgebirge is the eroded remnant of an old plateau, which at present has an extreme elevation of about 3400 feet and occupies an area of 380 square miles. Schneeberg, the highest peak, is about 3450 feet above sea level, while Ochsenkopf, Nusshardt, and Farnleite are more than 3000 feet. The main chain is bordered on the north and south by the small groups of the Waldstein and the Weissenstein. Geologically the Fichtelgebirge consists of granites, gneisses, and schists of Archæan and Paleozoic age. Rich deposits of copper, lead, and iron ores were the bases of an important metallurgical industry at one time, but they are now practically exhausted. In the more elevated portions the climate is raw and moist and suited only to the cultivation of the hardier grains and to pasturage, but in the lower parts there are delightful watering places, as Alexandersbad. Cut stone, lumber, and cotton and woolen manufactures are the principal products. The range forms the watershed between the Eger, the Main, and the Naab, and is thus drained by the great river systems of the Elbe, Rhine, and Danube.

FICINO, fē-chē'nō, MARSILIO (1433–99). An Italian philosopher of the Renaissance. He was born in Florence, the son of the principal physician of Cosmo de' Medici, and to the liberality of this Prince he owed the classical culture which inspired his future career. After some years of enthusiastic study he appeared as a public teacher of Platonic philosophy and was chosen by Cosmo to preside over his newly founded Platonic Academy. He translated into Latin Plato's own works and those of the Neoplatonists Plotinus, Iamblichus, and Proclus, with commentaries. His most important original work was his *Theologia Platonica de Animorum Immortalitate*, in which he gave a systematic presentation of his beliefs. His whole life was devoted to the study and teaching of the Platonic philosophy, which he believed to be, while not perfectly Christian, yet the nearest to the Christian principles, and therefore calculated to win back to Christianity minds which had been led astray by a false philosophy. His collected works, including his translations of Plato and Plotinus, were first published at Basel (2 vols., 1561–76), and his biography by Corsius at Pisa (1771). Consult Symonds, *Renaissance in Italy: The Revival of Learning* (New York, 1888).

FICK, ADOLF EUGEN (1829–1901). A German physiologist. He was born at Cassel and was educated at Marburg and Berlin. He was lecturer and professor at Zurich from 1852 to 1868 and from 1868 to 1899 professor at Würzburg. His publications include *Die medizinische Physik* (3d ed., 1885) and *Kompendium der Physiologie* (4th ed., 1891).

FICK, August (1833–). An eminent German philologist. He was born at Petershagen, Westphalia, and studied under Benfey at Göttingen from 1852 to 1857, and then taught in the gymnasium there until his appointment in 1876 to an extraordinary professorship of comparative philology in the university. In 1887 he became professor at Breslau. His greatest work is the *Vergleichendes Wörterbuch der indogermanischen Sprachen*, vols., i, ii (4th ed., 1890–94). Other works are: *Die griechischen Personennamen* (2d ed., 1894); *Die ehemalige Spracheinheit der Indogermanen Europas* (1875); *Die homerische Ilias, in der ursprunglichen Sprachform wiederhergestellt* (1886); *Gesammelte Schriften* (4 vols., 1903–06); *Vorgriechische Ortsnamen* (Göttingen, 1905); *Hattiden und Danubier in Griechenland; weitere Forschungen zu den Vorgriechischen Ortsnamen* (ib., 1909); *Die Entstehung der Odyssee und die Versabzahlung in den griechischen Epen* (ib., 1910). His pupils and friends issued a volume entitled *Tépas* in honor of his seventieth birthday (ib., 1903).

FICK'ER, Adolf (1816–80). An Austrian statistician, born at Olmütz. He was educated at Vienna and in 1873 was appointed president of the Central Bureau of Statistics, of which he had previously been secretary (1853–64) and director (1864–73). He also rendered important services as referee for realschulen and gymnasia in the Ministry of Education. His principal works are: *Die Bevölkerung der österreichischen Monarchie* (1860); *Die Bevölkerung Böhmens* (1864); *Völkerstämme der österreichisch-ungarischen Monarchie* (1869); *Geschichte, Organisation und Statistik des österreichischen Unterrichtswesens* (1871). He was also the founder of the *Statistische Monatsschrift* (1875), now published by the Imperial Bureau of Statistics, Vienna.

FICKER, Julius (1826–1902). A German jurist, born at Paderborn and educated at Bonn, Münster, and Berlin. In 1852 he became professor of history and jurisprudence at Innsbruck. He became a member of the Vienna Academy of Sciences in 1866 and retired in 1879. His most important work is entitled *Forschungen zur Reichs- und Rechtsgeschichte Italiens* (1868–74). He wrote also: *Rainald von Dassel, Reichskanzler und Erzbischof von Köln* (1850); *Vom Reichsfürstenstande* (1861); *Beiträge zur Urkundenlehre* (1878).

FICORONI (fē'kō-rō'nē) **CIST, The.** The most celebrated of the ancient *cistæ* (jewel or toilet caskets) found in Italy. It was discovered near Palestrina (see Præneste) in 1738. It came into the possession of the Italian antiquarian Ficoroni and was by him presented to the Museo Kircheriano at Rome. The casket is of cylindrical form, about 18 inches high and 12 to 14 inches in diameter, and bears representations of scenes from the story of the Argonauts—the arrival of the Argonauts in Bithynia, and the conquest of Amycus by Pollux in a boxing match. These representations are of the finest Greek workmanship. The figures are deeply incised. There are also two inscriptions, which date from the third century B.C., which give the names of the owner and of the artist. Consult Baedeker, *Central Italy and Rome* (15th Eng. ed., Leipzig, 1909).

FICQUELMONT, fē'kĕl'mōN', Karl Ludwig, Count (1777–1857). An Austrian statesman and general, son of a Frenchman in the Austrian army. He was born at Dieuze, Lorraine, and entered the military service of Austria in 1793. He participated in all the campaigns against France, rose to the rank of major general, and was Ambassador Extraordinary to Sweden (1814), Tuscany and Lucca (1820), Naples (1821), and Russia (1829), where he was an extremely influential agent of Metternich. In 1839 he was recalled to Vienna to assume the duties of the Foreign Office during the absence of Prince Metternich. After the revolution of March, 1848, he was again in charge of the Department of Foreign Affairs, and had become premier pro tem, when popular feeling against him compelled him to resign (May 3), partly because he had a kinsman, Count Baillet von Latour, in the War Ministry. The following are his principal works: *Aufklärungen über die Zeit vom 20 März bis zum 4 Mai, 1848* (2d ed., 1850) and *Die religiöse Seite der orientalischen Frage* (2d ed., 1854).

FICTION. See English Literature; Novel; Romance.

FICTION OF LAW (Lat. *fictio*, a fashioning, a feigning, from *fingere*, to fashion, to feign). A legal assumption that something is true which is known not to be true or which may be false. The term "legal fiction" is used by Sir Henry Maine in a wider sense than that given to it in the Roman law or by most English-speaking lawyers. He employs it "to signify an assumption which conceals, or affects to conceal, the fact that a rule of law has undergone alteration, its letter remaining unchanged, its operation being modified." In this sense it includes every modification of existing rules of law by judicial decision. It is to this process of changing legal rules by the fiction that judges are simply declaring the law, when, in fact, they are changing it in order to make it conform to the new standards of morality or to the enlarging needs of society, that English common law owes its elastic and progressive character.

Examples of legal fiction, using the term in its narrower sense, are found in the old forms of pleading. In the action for the *conversion* (q.v.) of goods the plaintiff's declaration alleged that he had lost the goods in question and that the defendant had found them. This allegation was generally untrue, but the defendant was not permitted to deny it, the form of action employed, known as the action of *trover* (Fr. *trouver*, to find), being based on the assumption that the defendant was unlawfully detaining chattels of the plaintiff which he had found. By a fiction of pleading the courts of King's Bench and Exchequer came to share in the jurisdiction of the Common Pleas. Originally (as has been pointed out under Court and Exchequer, Court of) the King's Bench was a criminal court exclusively, and its jurisdiction over civil actions was obtained by permitting the plaintiff to allege falsely that the defendant was in the custody of the King's marshal for a breach of the peace. Having brought the defendant before the court on this fictitious charge, the plaintiff was allowed to proceed against him for the civil wrong of which he had actually been guilty, even though this had involved no breach of the peace or other criminal wrong, the defendant not being permitted to dispute the allegations which gave the court jurisdiction. In a similar manner the Exchequer extended its jurisdiction over civil actions by permitting a plaintiff to allege that he was a debtor of the King and was prevented from paying his debt by the defendant's wrongful act or default. "And these fictions of law," Blackstone observes, "though at first they may startle the student, he will find them upon further consideration to be highly beneficial and useful, especially as this maxim is invariably observed, that no fiction shall extend to work an injury, its proper operation being to prevent a mischief or remedy an inconvenience that might result from the general rule of law." Consult Maine, *Ancient Law* (London, 1887), and the authorities referred to under CONSTITUTIONAL LAW; CUSTOM; JURISPRUDENCE.

FICTOOR, fĭk'tōr, JAN. See VICTORS, JAN.

FI'CUS. A genus of plants of the family *Moraceæ*, comprising about 600 mostly tropical species, very diverse in habits of growth and in products useful to man. *Ficus elastica* is the rubber plant of greenhouse and conservatory. See BANYAN; FIG; LAC; RUBBER.

FICUS CAMPUS. See FÉCAMP.

FI'CUS RU'MINA'LIS. The sacred fig tree which protected Romulus and Remus when they were abandoned on the banks of the Tiber. It stood near the Lupercal, at the base of the Palatine Hill (see LUPERCALIA), and, according to the tradition, was miraculously conveyed by the augur, Attus Navius, to the Comitium. Beneath it stood the famous bronze statue of the wolf. The tree is said by Tacitus to have shown no signs of decay until 841 years after it had sheltered the twins. Consult Platner, *The Topography and Monuments of Ancient Rome* (2d ed., New York, 1911).

FIDDLE. See VIOLIN.

FIDDLER BEETLE. See FUNGUS BEETLE.

FIDDLER CRAB. A small crab of the genus *Uca* (or *Gelasimus*), enormously abundant on muddy shores along the eastern coast of the United States south of Cape Cod. "The males have one claw very largely developed; the other chela is small. The former is likened to a fiddle, the latter to a bow; and this, together with the waving motion of the large claw, gives them their popular name. . . . The female has claws of small and equal size." The largest, commonest, and most inland-ranging species is *Uca minax*, easily distinguished by having a patch of red at the joints of the legs. Another, extending its range around the Gulf of Mexico and throughout the West Indies, is *Uca pugnax*. A third species (*Uca pugilator*) is more marine, inhabiting sandbars and beaches. All are gregarious, congregating in the salt marshes in countless numbers and making burrows in the mud, just above the line of high tide. These holes are from ½ inch to 2 inches in diameter. The crabs occupy them as refuges, and *Uca minax* forms of pellets of mud an arched penthouse over its hole, in which it sits and watches what goes on. All the species wander about a good deal, and when alarmed scuttle sidewise with comical speed into the first burrow they come to. They are vegetarians, feeding on minute algæ, etc., which they scrape up and put into the mouth with the smaller claws. The burrowing of this crab often does serious injury to embankments, particularly the levees near the mouth of the Mississippi. Consult Verrill, *Invertebrates of Vineyard Sound* (Washington, 1874), reprinted in Goode, *Fishery Industries*, Section I (Washington, 1884), and Arnold, *The Sea Beach at Ebb-Tide* (New York, 1901). See CRAB, and Plate of CRABS.

FIDDLER FISH. See GUITAR FISH.

FIDEICOMMISSUM, fī'dē-ĭ-kŏm-mĭs'sŭm (Lat., committed to faith, bequest). At Roman law the *fideicommissum* was a trust bequest. During the republican period a valid bequest could be made only in the form of a legacy in a regular testament. It was, however, not unusual for a person, acting in contemplation of death, but not wishing to leave a testament, or not wishing to substitute a new testament for one already made, to charge the person who was to take the inheritance, whether by law or by testament, with the duty of paying a sum of money, or giving some particular thing or things, to a third person; or to charge the person who was to receive a legacy with the duty of transmitting the legacy or some portion of it or of its value to a third person. Such directions might be given in writing (*codicilli*) or orally, before witnesses or without witnesses; but in no case, before the time of Augustus, was the duty imposed by such a charge anything more than a moral duty. Augustus made all such bequests, however informal, recoverable by action and instituted a special court for trust-bequest cases. During the early Imperial period it became usual to impose upon an heir, by such a trust bequest, the duty of handing over to a third person the entire estate or some fractional part of it (so-called "universal" trust bequest); and it was enacted by the Senate that in such cases the third person should be compelled to accept, in proportion to the share of the estate which he was to receive, the position and obligations of an heir or universal successor. The effect of this whole development was that testation was practically freed from all formalities. In the late Empire a reaction occurred in favor of greater formality; and in the Justinian law a codicil with five witnesses was required for the establishment of trust bequests. Justinian, indeed, enacted that an oral charge imposed upon the heir should be actionable, but excluded all evidence except that of the claimant and the heir, and provided that the heir should be freed upon taking oath that he had received no such charge. *Fideicommissa* were introduced and developed to accomplish ends that could not be accomplished at the Roman law by testament. By a trust of this sort it was possible, e.g., to leave the ownership of an entire estate or of a particular piece of property to one person for a definite term or for life, or subject to a condition subsequent, and then to another person (*substitutio fideicommissaria*). Arrangements of this character are permitted, with limitations, in the Spanish civil code (secs. 781-786) and in the French civil code (secs. 1048-74). In the German Imperial Code the same result is reached through what is termed postinheritance (*nacherbschaft*). In German law *fideicommiss* has become the technical term for an estate permanently entailed. Consult the authorities referred to in the article CIVIL LAW.

FIDEI DEFEN'SOR. See DEFENDER OF THE FAITH.

FIDELIO, fē-dā'lyō. An opera by Beethoven (q.v.), first produced in Vienna, Nov. 20, 1805; in the United States, Sept. 28, 1839 (New York).

FIDELITY INSURANCE. See INSURANCE.

FIDE'NÆ. An old and important city of Latium, situated on a hill (now Castel Giubileo) on the south bank of the Tiber, about 5 miles north of Rome, on the Via Salaria; it was supposed to have been founded by the Etruscans. It is said that no other city played so important a part in the history of early Rome as did this city. As early as the days of Romulus ill will, with frequent strife, existed between the two cities and continued, with short intervals of peace, until 496 B.C., when the Fidenates were forced to surrender. In 438 B.C. they revolted again, killing the Roman ambassador, and they were not subjugated until 426 B.C., when their city was taken, and they were sold into slavery. During the Republic and the Empire it was only a small country village, of some importance as a post station, but remarkable chiefly for a terrible calamity which occurred during the reign of Tiberius, when about 50,000 persons were killed by the fall of an amphitheatre during a gladiatorial contest. (Consult Tacitus, *Annales*, iv, 62, etc.) No ruins of Fidenæ exist beyond a few rock-cut tombs (pre-Roman) and drains. Consult: Dennis, *Cities and Cemeteries of Etruria*, vol. i (2d ed., London, 1883); Ashby, *Papers of the British School at Rome*, vol. iii (ib., 1906); Nissen, *Italische Landeskunde*, vol. ii (Berlin, 1902).

FIDU'CIARY (Lat. *fiduciarius*, relating to a trust, from *fiducia*, trust, from *fidere*, to trust). A legal term designating a person in whom peculiar trust and confidence are reposed by another, or the relation which subsists between such persons, or a liability incurred by one of these persons towards the other. The most important examples of fiduciary relations are those of parent and child, of guardian and ward, of lawyer and client, of physician and patient, of trustee and cestui que trust, of principal and agent, of principal and surety, and of partners. When the relationship does exist, the rule obtains that the fiduciary—the person in whom a special confidence and trust is reposed—is bound to act towards the other party to the relation with the utmost good faith. If he receives a gift from the other, or enters into a contract with him, and its validity is challenged, the burden of proof is upon him to show that he took no advantage of his influence or knowledge, but, on the contrary, that the other acted with perfect freedom as well as with full knowledge of all the facts relating to the transaction. Indeed, in England a much stricter rule than this is applied to gifts from clients to legal advisers made during the continuance of the relationship; they may be set aside upon the application of the client or his personal representatives. In other words, the presumption of undue influence in such' a case is conclusive. A trustee or an agent, charged with the sale of property belonging to his cestui que trust or his principal, is not allowed to become the purchaser or to make any secret profit out of the sale.

The term "fiduciary capacity" in the United States bankruptcy statutes has received a narrow construction. By these statutes debts contracted "in any fiduciary capacity" are excluded from the operation of a discharge in bankruptcy. It has been ruled by the United States Supreme Court that the term in this connection includes only debts contracted by technical trustees, i.e., trustees appointed by will or by deed or by order of a court, and does not extend to debts owing by agents or attorneys to their principals. Consult: Bigelow, *Elements of Equity, for the Use of Students* (Boston, 1879); Lowell, *The Law of Bankruptcy* (ib., 1899); and the authorities referred to under such titles as AGENT: ETC.

FIDUS ACHATES, fī'dŭs ȧ-kā'tēz. See ACHATES.

FIEDLER, fē'dlẽr, **MAX** (1859-). A German orchestral conductor. He was born at Zittau, where he received his first instruction on the piano from his father, a music teacher. From 1877 to 1880 he studied under Reinecke and Jadassohn at the Leipzig Conservatory. In 1882 he became a teacher in the Conservatory at Hamburg, and in 1903 director. At first he appeared as a pianist, but soon organized orchestral concerts of his own, the success of which led to his election as conductor of the Hamburg Philharmonic Society in 1904. In 1907 he appeared as "guest" conductor with the New York Philharmonic Society, and from 1908 to 1911 he was the regular conductor of the Boston Symphony Orchestra. After his return to Germany he resumed his post with the Hamburg Philharmonic Society, and appeared frequently in Berlin and St. Petersburg. As a composer, he made himself known through some chamber music and a symphony in D minor.

FIEF, fēf. See FEE.

FIELD (AS., OHG. *feld*, Ger. *Feld*, field; connected with AS. *folde*, Icel. *fold*, soil, and ultimately with Gk. *πλατύς platys*, Lith. *platùs*, Skt. pṛthu, *broad*, and with OHG. *flaz*, Icel. *flatr*, Eng. *flat*). In heraldry (q.v.), the whole surface of the escutcheon or shield on which the "charge" is displayed; sometimes also one of the divisions thereof.

FIELD, CYRUS WEST (1819-92). An American financier, the projector and promoter of the first submarine telegraph cable between Europe and America, born at Stockbridge, Mass. He was the brother of David Dudley Field, the eminent lawyer, and of Justice Stephen J. Field of the United States Supreme Court. At the age of 15, abandoning the idea of a college education, he removed to New York City. At the end of three years he removed to Stockbridge, but two years later he again removed to New York. He was at first in the employ of A. T. Stewart and afterward junior partner in a firm of paper merchants. A disastrous failure having ensued, Field effected a temporary settlement with the creditors and set up in an independent business. Close application finally rewarded his efforts; he took his brother-in-law into partnership, and on Jan. 1, 1853, at the age of 33, retired from active participation in the business, with a fortune of $250,000.

A meeting with Frederick N. Gisborne (q.v.), a Canadian electrical engineer, in 1854, determined the channel into which Field's indomitable energy was to be turned. Gisborne was in New York attempting to interest capitalists in an undertaking to construct an overland telegraph line across Newfoundland, connecting Cape Ray and Cape Breton by fast steamships or carrier pigeons, and perhaps eventually by a submarine cable under the Gulf of St. Lawrence. Field took Gisborne's plans under advisement and, in studying up the matter, became convinced not only that the scheme was practicable, but that the time was opportune for organizing a company to lay a transatlantic cable from Newfoundland to Ireland. He was not the first to entertain such an idea, but he was the first to put it into operation. With this more extended purpose in view, Field set to work to interest some of his friends, with the result that in May, 1854, was organized the New York, Newfoundland, and London Telegraph Company, with Peter Cooper as its president. In 1856 the United States government, at Field's request, sent Lieutenant Berryman in the *Arctic*, to take deep-sea soundings along the route of the proposed cable, with the result that the existence of the telegraphic plateau was confirmed. A British expedition under Lieutenant Dayman, sent also at Field's solicitation, further confirmed this fact. In August, 1857, the first attempt at laying the cable was made from Valentia, on the Irish coast. It failed, but in June, 1858, attempts were resumed. Time and again a start was made, but always unsuccessfully, 200 miles being the greatest length laid.

In spite of these disheartening failures Mr. Field did not despair, and in July another attempt was made, this time with success. On Aug. 16, 1858, the first message was transmitted from Queen Victoria to President Buchanan. But even while the success of the undertaking was being celebrated the cable broke. Mr. Field's firm had failed as a result of the panic of 1857, and he was now compelled to go into bankruptcy. Still he did not lose heart, nor give up his faith in the ultimate success of a transatlantic cable. A contract was let to an English construction company, a new cable was constructed, weighing 300 pounds to the mile instead of 107 pounds, the weight of the old cable, and the *Great Eastern*, the largest steamship afloat, was chartered to lay it. On July 23, 1865, the *Great Eastern*, with Mr. Field on board, started westward from the Irish coast, near Valentia, but the cable broke within 600 miles of the Newfoundland coast. On July 13, 1866, the *Great Eastern* started from Valentia on her second, and this time triumphant, voyage. The Newfoundland coast was reached on July 27 without a mishap, and the land connection was successfully made. From this time on communication with Europe by telegraphic cable was undisturbed. The succeeding years were spent by Mr. Field in railroad development. He was one of the original projectors of the elevated railroad system in New York City, resigning its presidency and that of the Wabash, St. Louis, and Pacific Railway in 1880, on retiring from active participation in business. Business reverses troubled his last years. Consult: Isabella Field Judson (his daughter), *Cyrus W. Field: His Life and Work* (New York, 1896); also H. M. Field, *Story of the Atlantic Telegraph* (ib., 1878; 1903); Reid, *The Telegraph in America* (ib., 1878); Bright and Bright, *Life of Sir Charles Tilston Bright* (London, 1898); Russell, *The Atlantic Telegraph* (ib., 1868).

FIELD, David Dudley (1781-1867). An American Congregational clergyman and historical writer. He was born in East Guilford, now Madison, Conn., graduated at Yale in 1802, and held pastorates at Haddam, Conn., and Stockbridge, Mass. He wrote *A History of the Town of Pittsfield, in Berkshire County, Massachusetts* (1844), and a *Genealogy of the Brainerd Family* (1857). His four remarkable sons (David Dudley, Stephen Johnson, Cyrus West, and Henry Martyn Field) are separately treated.

FIELD, David Dudley (1805-94). An eminent American jurist and law reformer, son of David Dudley Field (q.v.), a Congregational clergyman. He was born at Haddam, Conn., graduated at Williams College in 1825, studied law first in Albany, N. Y., and afterward in New York City, and was admitted to the bar in 1828. He commenced practice in New York and speedily acquired a leading position at the bar. This was due quite as much to his extraordinary energy and public spirit and to his zeal for law reform as to his unusual learning and skill as a lawyer. Though possessed of a large professional practice, he devoted all the time which he could spare from pressing engagements for 40 years to the reform of the law. He began the movement by writing articles in reviews and papers and pamphlets, showing the urgent necessity of a reform in methods of legal procedure. Having been appointed in 1847 a commissioner on practice and pleading by the Legislature of New York, he devoted himself first to the preparation of a code of civil procedure which was promptly enacted into law. The design of the new system was to wipe out the distinction between the forms of action and between legal and equitable remedies, in order that all the rights of the parties in relation to the subject of legislation could be decided in one and the same forum and in a single action. This system has been adopted in most of the American States and is the basis of the reformed procedure established in England by the Judicature Act of 1873 (36 and 37 Vict., c. 66). The same commission framed a code of criminal procedure, which has also been adopted in most of the States. In 1837 Mr. Field was placed at the head of a new commission to prepare a political code, a penal code, and a civil code, which were finished and reported in 1875, but which, owing to the bitter opposition of the bar of the State, and especially of New York City, has never been adopted by the State of New York, though the civil and penal codes were passed by the two Houses, almost unanimously, in 1879, and failed only for want of the Governor's signature to become the law of the State. They have been of great service, however, in the legislation of many of the States, especially in California and Dakota, where they were adopted with a few alterations that were necessary in order to adapt them to local conditions.

Mr. Field's interest in reform was not confined to the civil or municipal law, but embraced the field of international relations. In 1866 the British Association for the Promotion of Social Science held a meeting at Manchester, at which Mr. Field made a proposal for a general revision and reform of the law of nations, similar to that aimed at in his labors for the reform of the civil and criminal law. Acting on his proposal, he completed in 1873 a work entitled *Outlines of an International Code*, which he presented to the social science congress of that year, and which met with very favorable criticism from eminent jurists all over the world. In 1873 he was elected first president of an association for the reform and codification of the law of nations, formed at Brussels in that year.

Mr. Field was a lifelong Democrat in his political convictions, but belonged to the Free-Soil and antislavery wing of that party before the Civil War and during the war was a stanch supporter of the administration of Lincoln. The only party office ever held by him was that of Congressman, which he occupied by appointment for a short time in 1876 to fill a vacancy. Though distinguished in many ways, his fame rests chiefly on his achievements as a law reformer, in which field of high and disinterested service he occupies a foremost place. Many of his principal papers on law reform are included in his *Speeches, Arguments, and Miscellaneous Papers* (New York, 1884–90).

FIELD, Eugene (1850–95). An American poet and journalist, born in St. Louis, Mo. During several years of his childhood he lived in Massachusetts and Vermont, and, though he completed his collegiate education in Missouri, he showed in his work traces of New England and Western elements which coexisted rather than blended in his nature. At 23 he began newspaper work, and 10 years afterward he became associated with the Chicago *Daily News*, with which he was for 12 years identified through his column "Sharps and Flats." Far the largest part of his literary production first appeared here. It is of varied manner and quality, prose and verse, detached paragraphs and continued narratives, by turns quaint, grotesque, delicate, Rabelaisian, farcical, and pathetic. He seemed to have equal sympathy with the wild life of the prairie and with classic culture, for irresponsible Bohemian life and quiet domestic felicities. He is probably most widely known as a poet of childhood, but most admired as a humorist. His first publication, *The Denver Tribune Primer* (1882; reprinted in 1901 as *The Tribune Primer*), is one of the cherished rarities of the book collector. *A Little Book of Western Verse* (1889) and *A Little Book of Profitable Tales* (1889) are characteristic of his best original literary achievement. *Echoes from the Sabine Farm* (1893), in which he collaborated with his brother, R. M. Field, shows how fully he had absorbed the spirit of Horace. *The Love Affairs of a Bibliomaniac* contains his most delicately humorous essays; *With Trumpet and Drum* (1892) and *Poems of Childhood* (1904) well represent him as a children's poet. Several of his poems have been set to music, some of which may be found in *Musical Poems for School, Kindergarten, and Home;* music by Caro S. Seymour (1906). Consult Thompson, *Eugene Field: A Study in Heredity and Contradictions* (2 vols., New York, 1901).

FIELD, Frederick (1801–85). An English clergyman, born in London. He graduated at Trinity College, Cambridge, in 1823, became fellow of Trinity (1824), and was rector of Reepham, Norfolk, from 1842 to 1863. His scholarship was a rare combination of Greek and Semitic. He edited the Greek text of St. Chrysostom's *Homilies on Saint Matthew* (1839); St. Chrysostom's *Interpretation of the Pauline Epistles* (7 vols., in *Bibliotheca Patrum*, 1845–62); the Septuagint version of the Old Testament, according to the Alexandrian codex (subsequently revised and rearranged for the Foreign Translation Committee of the Society for Promoting Christian Knowledge); and Origen's *Hexapla* (2 vols., 1867–75). In 1870 he became a member of the Old Testament revision company. Consult the brief autobiography in his preface to Origen.

FIELD, George Wilton (1863–). An American biologist, born at North Bridgewater, Mass. In 1887 he graduated from Brown University (A.M., 1890), where he was later associate professor of cellular biology (1893–96), having in the meantime studied also at Johns Hopkins University (Ph.D., 1892), at the Naples Zoölogical Station, and in Munich. He was biologist of the Rhode Island Agricultural Experiment Station from 1896 to 1901, instructor in economic biology at Massachusetts Institute of Technology (1902), and in 1903 became biologist, and in 1904 chairman, of the Massachusetts Commission on Fisheries and Game. He became a director of the Massachusetts Audubon Society and in 1911 was president of the National Shellfish Association. His publications consist of reports and papers on original biological investigations and also *Lobsters and the Lobster Problem* (1910).

FIELD, Henry Martyn (1822–1907). An American clergyman, editor, and author, born at Stockbridge, Mass., a son of Rev. David Dudley Field and brother of the jurist of that name, as well as of Justice Stephen J. Field and Cyrus W. Field. He graduated at Williams (1838), studied theology, and from 1842 to 1847 was pastor of a church in St. Louis. Then, after three years of European travel, he became pastor of a church in West Springfield, Mass. (1851–54). After this he took up his residence in New York as editor and later, till 1890, as sole proprietor of the *Evangelist*, an influential Presbyterian paper, visiting Europe frequently, and making a tour of the world in 1877. His numerous volumes are chiefly stories of travel. Of these *From the Lakes of Killarney to the Golden Horn* (1876), *On the Desert* (1883), and *Old Spain and New Spain* (1888) are typical. He also wrote a life of his brother, David Dudley Field (1898), and *Story of the Atlantic Telegraph* (1878; 1903).

FIELD, John (1782–1837). An English composer, born in Dublin. He was the immediate precursor and probable model of Chopin and the modern school of pianoforte composition. Field came of musical stock. His father was a violinist, and his grandfather, of whom he took his first lessons, an organist. Subsequently, when the family removed to London, he was apprenticed to Clementi, who then had a pianoforte business, and who, recognizing the youth's remarkable gifts, taught him and employed him to show off pianofortes to customers. With Clementi he went in 1802 on an extended concert tour, visiting Paris, Germany, and Russia, where his pianoforte playing was greatly admired. On a second visit to St. Petersburg in 1804 he remained there as a much admired teacher and virtuoso. He did not return to London until 1832, appearing there most successfully in concert. A subsequent tour in Italy proved a failure. Under the effects of disappointment and dissipation he broke down at Naples, where, nine months later, he was taken out of the hospital by a Russian family with whom he returned to Moscow. But he never recovered his health, and died in Moscow. Field's works that have survived are his *Nocturnes.* They were the first successful efforts at composition unrestrained by classical form and offering the composer freedom of poetic fancy. In their name, their romantic and subjective treatment, as well as in their technical aspect, they clearly indicate the starting point of Chopin and of the modern romantic school. His works include 7 concertos (No. 4 of which was the most popular), 4 sonatas, 2 airs en rondeau, 4 romances, 18 nocturnes, and numerous other pieces of kindred type. An essay on Field by Liszt and reminiscences of him in Spohr's autobiography will be found interesting. Consult H. Dessauer, *John Field, sein Leben und seine Werke* (Langensalza, 1912).

FIELD, Joseph M. (1810–56). An American actor and dramatist. He was born in London, came to America when very young, and for several years traveled through the country writing plays and acting them without attaining much reputation. In 1852 he assumed the management of a theatre in St. Louis, Mo., where he was also later principal owner and an editor of the *Reveille*, a daily newspaper. At the same time he became widely known for his humorous sketches signed "Straws" in the New Orleans *Picayune*.

FIELD, Kate (c.1840–96). An American journalist, lecturer, and actress, of eccentric talent. She was born in St. Louis, Mo., the daughter of Joseph M. Field (q.v.), was educated in New England and in England, and prolonged her stay in Europe as correspondent of various American newspapers, writing also for magazines. On her return she gave lectures and public readings and in 1874 appeared as Peg Woffington at Booth's Theatre, New York. She afterward abandoned the regular comedy for dance, song, and recitation, but achieved no striking success. In 1882–83 she headed a Coöperative Dress Association in New York, which achieved a conspicuous failure. In 1889 she established *Kate Field's Washington*, a weekly journal published in the capital. After 1868 she published numerous volumes of miscellaneous contents, no longer noteworthy.

FIELD, Magnetic. See Magnetism; Dynamo-Electric Machinery.

FIELD, Marshall (1835–1906). An American merchant, born in Conway, Mass. In 1856–60 he was clerk in Chicago in a wholesale dry-goods establishment, in which he was a junior partner from 1860 to 1865. In 1865 he became a member of the firm of Field, Palmer, and Leiter, which, in 1881, became Marshall Field and Company. Under his direction the firm obtained the largest wholesale and retail dry-goods business in the world, with headquarters in Chicago and branches in France, Germany, and England. He gave to the University of Chicago land valued at $200,000, with a gift of $1,000,000 founded in Chicago the Field Columbian Museum as a permanent repository for many exhibits of the World's Columbian Exposition of 1893, and bequeathed $8,000,000 for the endowment and maintenance of the museum upon the expressed condition that within six years after his death there should be provided, without cost to it, a suitable site.

FIELD, Michael. The pseudonym of two English women collaborators, the Misses Katherine Bradley (d. 1914) and Edith Emma Cooper (d. 1913), who wrote several poetic dramas and many lyrics. Among the most popular of their publications were: *Callirrhoë and Fair Rosamond* (1884); *The Father's Tragedy* (1885); *Canute the Great* (1887); *The Tragic Mary* (1890); *Long Ago* (1889); *Sight and Song* (1892); *Under the Bough* (new ed., 1893); *Attila, my Attila!* (1895); *Anna Ruina* (1899); *The Race of Leaves* (1901).

FIELD, Richard (1561–1616). A Church of England divine. He was born at Hemel Hempstead, Hertfordshire, Oct. 15, 1561, and graduated B.A. at Oxford in 1581. After a brilliant university career as instructor and scholar, he became in 1594 rector of Burghclere, Hampshire, and there and at Windsor, where he was a prebendary after 1604, he chiefly resided thenceforth. In 1610 he was made dean of Gloucester. He attended the famous Hampton Court Conference in 1603 and enjoyed the special favor of King James. His fame rests upon his great work, *Of the Church* (London, 1606; modern ed., 1853), one of "the grandest monuments of polemical divinity in the language." His son prepared a *Life*, which was edited by Le Neve in 1716.

FIELD, Stephen Dudley (1846–1913). An American inventor, born at Stockbridge, Mass. Besides many minor patents, his inventions include a multiple-call distance-telegraph box (1874), an electric elevator (1878), a dynamo quadruplex telegraph (1880), and a fast stock ticker (1884). Field was the first to apply dynamo machines to telegraphy (1879) and also the first to use the quadruplex telegraph on an ocean cable (1909).

FIELD, Stephen Johnson (1816–99). A distinguished American judge, born in Haddam, Conn., in 1816. He was the second son of the Rev. David Dudley Field (q.v.). At the age of 13 young Field made a voyage to the East in company with a brother-in-law, who was a missionary, and he spent three years in Smyrna and Athens. Returning to this country, he graduated at Williams College, in 1837, with the highest honors. He then studied law in the office of his brother in New York City and, after his admission to the bar, became his brother's partner and devoted himself energetically to the practice of law until 1848, when he went abroad and passed a year in Europe. On his return, in 1849, he joined the tide then setting towards California and established himself there, at a place where now stands the city of Marysville. He was elected the first alcalde of the place, holding the office until the organization of the judiciary under the constitution of the State. Under Mexican law an alcalde had a very limited jurisdiction, but after the American occupation the jurisdiction exercised by him in the anomalous condition of society in California at that time was practically unlimited. In 1850 he was elected to the Legislature and was placed on the Judiciary Committee. He drew up a bill defining the powers of the courts of justice and judicial officers of the State, which was passed, and most of its provisions are still retained in the California code. He also secured the passage of a law giving effect to the usages and regulations adopted by the miners for the protection and working of the mines. The principles embodied in this law were adopted in other mining regions of the country, and finally by act of Congress became the mining law of the United States territories. In 1857 he was elected Judge of the Supreme Court of California, and in 1859 he succeeded David S. Terry as Chief Justice. When Mr. Field came to the bench, the titles to lands in the State were unsettled, and it was largely through the decisions in which he delivered the opinions of the court that the law of real property in California was placed on a permanent basis. In 1863 he was appointed by President Lincoln an Associate Justice of the Supreme Court of the United States, a position which he held with increasing distinction until his retirement by reason of age in 1897. Here he played a conspicuous and important rôle, expressing himself with great force and freedom on all the great constitutional questions which came before the court for consideration during his long term of service, and being intrusted by the court with the duty of preparing many of its most important opinions. His opinions in the celebrated test-oath cases, in which the Supreme Court declared the invalidity of the "ironclad oath" imposed by act of Congress on all persons holding office under the government of the United States, and his dissenting opinions in the legal-tender, slaughterhouse, and income-tax cases were distinct contributions to American constitutional law and have become justly celebrated. In 1869 he was appointed professor of law in the University of California; in 1873, as one of a commission to examine and revise the codes of the State, he prepared important amendments which were adopted by the Legislature. He was a member of the famous electoral commission of 1877 which decided the presidency in favor of Rutherford B. Hayes, and he voted with the minority in favor of Samuel J. Tilden. As a judge, Field was noted for his independence of judgment and the strength of his convictions, as well as for the sanity and reasonableness of his views. He was a learned lawyer, but it was the breadth of his information and the range of his experience as well as the vigor of his mind which contributed most to his judicial equipment. His service on the bench of the Supreme Court, 34 years, the longest in the history of that tribunal, was also one of the most useful in its history.

FIELD ARTILLERY. The artillery which accompanies an army in the field. It may be classified as follows: (1) *Light Field Artillery* (guns of about 3-inch calibre; howitzers, 3.8 to 4.7-inch); (2) *Heavy Field Artillery* (guns, 4.7-inch; howitzers, 6-inch); (3) *Special Purpose Artillery:* (*a*) *Mountain or Pack Artillery* (calibre about 3-inch); (*b*) *Horse Artillery* (calibre about 3-inch). Calibres above 6-inch, used in siege operations, are classified as *Siege Artillery* guns, howitzers, or mortars. The development of field artillery and the field gun will be found in the historical sketch under ARTILLERY (q.v.), while under HORSE ARTILLERY, HOWITZER, LIGHT ARTILLERY, MOUNTAIN OR PACK ARTILLERY, and SIEGE ARTILLERY, these special branches will be considered. The present description is concerned with the modern field gun which is, indeed, a development of but a few years, but which played a most important part in the great European war of 1914.

The present quick-firing field gun, which permits the gun layer to maintain his position and sight on the target during the entire process of loading and firing, is the natural consequence of the introduction of smokeless powder. With the old ordnance the target was obscured by the smoke of discharge, and until this blew away the gun could not be re-laid. With the advent of smokeless powder, however, it was possible to keep the target in view, and some mechanical means by which the process of gun laying might be made continuous became a matter of concern. The solution was found in the hydraulic buffer or brake, and the stored energy by which the gun is returned to its firing position. This system was first utilized by the builders of naval ordnance, who introduced guns on this principle as a means of defense against the attack of small craft. (See GUNS, NAVAL.) It was not long, however, before the possibilities of this weapon were recognized by army artillerists, for we find General Wille, in his *Field Gun of the Future* (Berlin, 1891), and General Langlois, in his great work *Field Artillery in Connection with the Other Arms* (Paris, 1892), advocating a gun and principles which have since been largely realized in the field gun as we now know it.

The first practical application of the principles laid down by these writers was made in the new *matériel* of the French artillery, which made its appearance in 1898. This *matériel* and the methods prescribed for its use were so immeasurably ahead of anything else then in existence that they may be said to have revolutionized the subject of field artillery. All other nations were compelled to rearm with a somewhat similar equipment, and to copy, to a greater or less extent, the new tactics of the French. It was not, however, without opposition, especially in Germany and England, that these methods were incorporated into the training of their armies, and as late as 1914 Germany prohibited the use of the covered position in many situations where it would have been employed unhesitatingly by the French or American artillerist.

Description of Light Field Gun. The modern light field gun, to which falls the bulk of mobile artillery work, is approximately 3 inches calibre (3.3 inches in England); about 30 calibres long, i.e., 30 times the diameter of the bore, and weighs, with its carriage (unlimbered), from 2000 to 2500 pounds; when limbered (limber filled with ammunition), the weight varies from 3900 to 4500 pounds. The latter figure is the weight of the British 18-pounder, which fires the heaviest projectile of all modern light artillery guns. The gun proper ordinarily consists of a steel tube, over which is shrunk a jacket with the necessary locking hoop, and recoil lugs or clasps by which the gun is secured to the cradle. The jacket usually contains the recess for the breech block. This may be of the wedge type, in which the block slides transversely across the breech end of the gun, or the interrupted or stepped screw system, in which the block swings about a hinge pin and is locked to the gun by means of screw threads on both block and breech recess which are engaged by the rotation of the block. The former type is used by Krupp, while the latter system has been adopted by practically all other makers.

Material. Steel is now the only metal used in gun construction. Bronze was formerly much in favor, but Austria, the last nation to employ this substance, decided in 1912 to change to steel for all future manufactures.

Carriage. The carriage of the modern field gun is made almost entirely of steel and consists of the lower or traveling carriage (axle, trail, and wheels), the rocker, and the cradle. The rocker is simply a frame upon which the cradle is supported, and by means of which it is elevated or moved in direction so as to bring the gun upon the target. The cradle serves as a bed for the gun and as a housing for the recoil mechanism.

Recoil. Modern artillery differs from that of former years in the important particular that while the gun recoils the traveling carriage remains fixed, so that the piece does not require repointing after each shot, and the cannoneer need not step aside, as was formerly required. This is accomplished by introducing a hydraulic buffer or brake, which absorbs the energy of recoil by means of the passage of the liquid through small ports or openings in the piston.

At the end of recoil the gun is returned to its firing position by compressed air or by springs which have been compressed during the recoil. The former method, originally the secret of the French artillery, has been used in the guns manufactured by Schneider and Company for the Spanish, Servian, and Bulgarian artillery, and gave excellent service in both north Africa and the Balkans. The spring column is used in the product of Krupp, and in the American, English, German, and many other guns. The objection to this system is the tendency of the springs to lose their resiliency, and, moreover, they sometimes break. No trouble with the compressed-air system is known, and it is generally more favorably regarded by artillerists.

Ammunition. The ammunition carried by modern field artillery consists of shrapnel, shell, and a composite projectile combining the properties of these two and variously described as combined shrapnel, high-explosive shrapnel, and universal shell. Great Britain, alone of the first-class powers, so late as 1914 carried nothing but common shrapnel with her light field guns, but, judging from comments in British prints, she, too, was likely to equip her field artillery with either shell or combined shrapnel. See AMMUNITION; SHRAPNEL; SHELL; PROJECTILES.

Propelling Charge. The propelling charge for the light field gun consists of approximately 1½ pounds of smokeless nitrocellulose powder. See EXPLOSIVES.

Ranging. Two general methods are used to determine the range to the hostile target. The first, the one in which artillerists have placed their greatest faith, consists of a process of ranging, or, more properly speaking, adjusting, since the length of fuse to explode the shrapnel or shell, and, in the case of indirect aiming, the deflection angles, must be determined as well as the range to the target. In this system the target is bracketed between two groups of shots, one of which is surely short of the target and the other surely beyond. The bracket thus obtained (usually 400 yards or meters) is reduced by halving until in most cases a 100-yard bracket is obtained. In the case of percussion fire the bracket is reduced to 50, or even 25 yards at the shorter ranges. During the ranging series the deflection angle and corrector are changed until the group of shots is brought to burst in air close to the ground and directly in line with their proper part of the target, so that the latter will be hidden by or silhouetted against the smoke produced by the bursting of the shrapnel. Thus, according to the United States regulations, a battery would open fire against a hostile battery, using the indirect method (sights directed on an auxiliary mark or aiming point) with a deflection of say 2000 mils,* a deflection difference of —10, corrector 25, and range 3000 yards. The shots of the salvo are observed to burst on percussion somewhat to the right of the target, which is measured (either by a graduated ruler, field glass, or telescope) and found to be 50 mils to the right. The four shots are also observed to burst on a front less than that of the target. The second salvo would be fired with an increase of 50 in the deflection to bring the shots to the left, an increase of say 3 in the deflection difference in order to increase the width of the sheaf, and an increase of 5 in the corrector so as to get the burst into the air. Inasmuch as the first salvo burst considerably to the right of the target, it is not likely that the battery commander could have observed whether the range was "short" or "over," and he would probably repeat the range. Assume three of this second salvo to have burst in air and one on percussion, all short of and well distributed over the front of the target; for the next salvo the range would be increased 400 yards, the deflection, deflection difference, and corrector remaining unchanged. Suppose this to be over, and we have the 400-yard or long bracket; the next salvo would be fired with a range 200 yards less, which, if over, would cause a further reduction of 100 yards, which we will assume to be short, thus inclosing the target between 3100 and 3200. The corrector would be raised enough to give a burst 3 mils high (at which the maximum effect is obtained), and fire for effect is started with such speed and under such methods as the tactical situation and the ammunition supply suggest.

For infantry in the open a 200-yard bracket would probably be the smallest that could be obtained, in which case fire for effect would be delivered at different ranges within this bracket. For cavalry, a larger bracket, 400 or 500 yards, would be appropriate.

Registering the Terrain. Another method, countenanced largely by the French, consists of firing a number of shots with different deflections and elevations, and, by noting and recording where they strike, a battery is prepared to turn loose a sudden fire for effect without the loss of time necessary for ranging. This is particularly appropriate in the case of rapidly moving targets which are likely to disappear from view before the process of ranging can be completed.

Fire for Effect. Modern formations and tendencies towards concealment have given rise to the rafale or squall system of artillery fire, made possible by the rapid-fire gun and smokeless powder, in which each gun fires one or more rounds, as may be indicated in the commands. The French also use what they term progressive fire, in which each piece in the battery fires two rounds at each of four ranges, varying by 100 meters, all of which is executed at a single command, and the 32 shots are discharged in less than one minute. In progressive-fire sweeping three shots are fired at each range, thus covering an area of approximately 100,000 square meters with 48 shrapnel containing 13,916 balls, in less than 1½ minutes. Progressive fire consumes great quantities of ammunition, and the French regulations have limited its use to the case of important fleeting target. This method, once taught in the United States artillery, has been abandoned in the regulations of 1911.

Another method is to subject the hostile target to a continued rain of projectiles at a uniform interval of discharge. This practice is not much favored, for the reason that the enemy soon learns to time the shots and can seek shelter accordingly, as was actually done by the Japanese during the Manchurian War.

These methods apply to shrapnel fire. As has been stated, the ammunition supply of field

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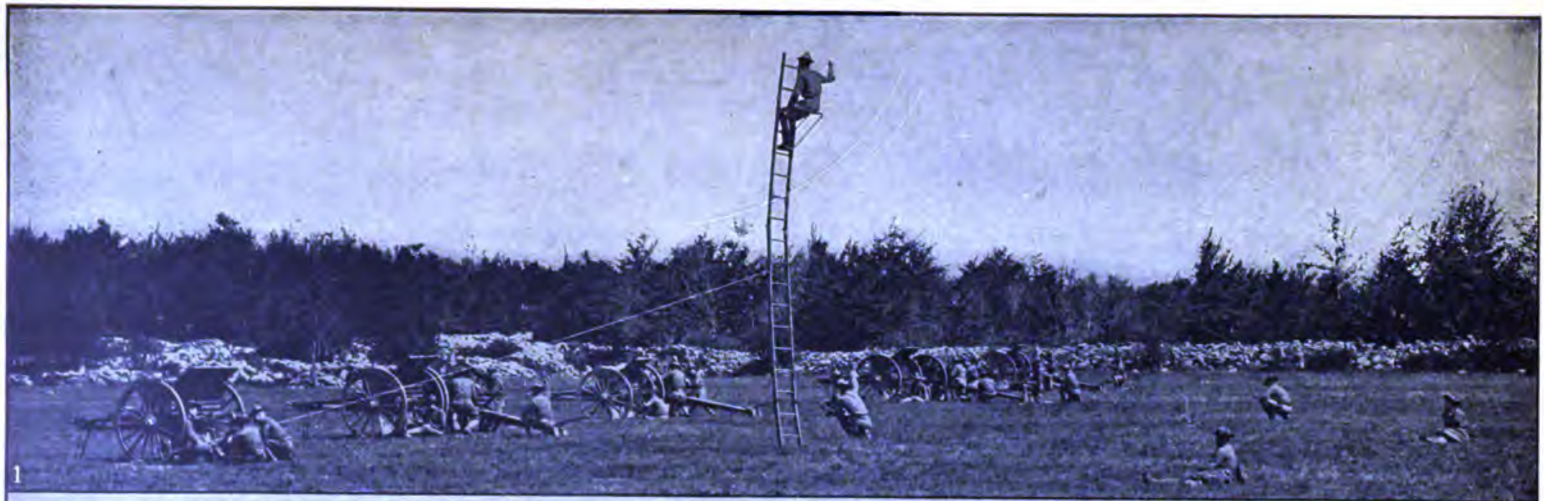
* Artillery angles are usually measured in mils (a contraction of *millièmes*, meaning thousandths). Thus, the chord subtending an angle of 1 mil is approximately $\frac{1}{1000}$ of the radius, or range. In order to make this ratio exact it would be necessary to divide the circle into 6283 divisions ($2\pi \times r$). This number is not convenient for division, so 6400, which obviates this objection and gives a ratio approximating $\frac{1}{1019}$, has been arbitrarily adopted.

FIELD ARTILLERY


1

2

UNITED STATES FIELD ARTILLERY AT PRACTICE

1. BATTERY IN ACTION. The battery commander on ladder is conducting fire against a target screened from the gun-layers by the trees in front.
2. FIELD BATTERY AT DRILL

FIELD ARTILLERY

EUROPEAN FIELD GUNS

1. KRUPP HEAVY FIELD HOWITZER UNDER TEST IN SOFT GROUND. Note the system of increasing the area of tread of tire on rear wheels.
2. KRUPP 7.5 CENTIMETER (2.95 INCH) 30-CALIBRE GUN IN TRAVELING POSITION.
3. THE SAME GUN IN FIRING POSITION. This is a general type in use in all armies.

artillery also includes explosive shell, and this projectile is used to drive troops out of stone buildings, from behind walls, from woods, and, for what artillerists believe to be its principal use, the destruction of hostile artillery *matériel*. The percussion fuse is employed, and the bracketing system is continued and narrowed until, long and short ranges being eliminated, direct hits may be expected. However, in this connection due allowance must be made for the accumulated error of gun, gunner, and ammunition, for, even with a perfectly adjusted firing, only about one shot in six can be expected to hit an exposed gun and caisson 3000 yards away. These are peace figures. War conditions would make the percentage of hits considerably smaller.

Positions. The most revolutionary and far-reaching development in the use of field artillery, introduced by the French in 1898, consists in the employment of guns from concealed or covered positions, usually behind a hill crest, or even an intervening wood or a field of high grain. As the gun layers cannot see the target, they direct their sights on an auxiliary aiming point, making the necessary correction for the angle between the aiming point and the target. Telescopes with goniometric attachments form part of the battery equipment and are set up at a point in the vicinity of the guns from which the target can be seen. From that point the battery commander, by means of the numerical data in his commands, shifts the planes of fire of all the guns in his battery until they are brought to bear on the desired part of the target. When time is pressing, these angles can be measured with a small ruler held at arm's length or even with the width of the hands and fingers, which are duly calibrated. In order to follow this system it is necessary that all guns be provided with some kind of goniometer. That most in use is the panoramic sight, the object glass of which turns 360° about a vertical axis while the eyepiece remains stationary. By this means any point in the landscape is brought into view, and if the angle between the selected aiming point and the target be known, it is a simple matter to point the guns at the target by directing the sights upon the selected aiming point.

A considerable zone in front of the covering crest or mask lies beneath the path of the projectile that clears this mask. For this reason indirect fire is impracticable for the defense in the latter stages of the hostile advance, and then the guns must be brought up to the crest and fought according to the old direct methods in which the gunners actually see and aim at their separate targets.

Although the accounts of the Manchurian War seem to have clearly established the fact that exposed artillery stands little or no chance against concealed guns, a principle emphatically confirmed in the accounts of the Balkan War, yet there has been considerable opposition to the use of the concealed position. It is forbidden to the German infantry batteries. The Germans seem to prefer the semicovered position, in which the sight, raised above the gun by means of an extension rod, can just see over the crest. In order to make the flash invisible, the guns must be located 12 feet below the covering crest, and this has come to be the position most preferred by the French, at least in the early stages of the action.

Manœuvres. The manœuvres of artillery are confined to the evolutions necessary to get the guns into position. While marching on the road the carriages follow in a single column, and naturally move at the gait of the infantry with which they march. Preparatory to the occupation of a position the caissons, attached to the gun sections, ordinarily move alongside of their pieces, and the two carriages are manœuvred as a single element. During action the caisson remains alongside of the piece, and its shields serve as a protection to the cannoneers engaged in the process of serving ammunition. When moving to occupy position, its usual gait is the trot of 8 or 9 miles an hour. It is only in emergencies that the gallop is now used. Thus, when crossing a fire-swept area, the carriages would probably move singly at the greatest speed to which the horses could be urged. In approaching their chosen positions batteries utilize folds in the ground so as to conceal their approach. Artillery officers and scouts precede their batteries, which are carefully conducted to concealed positions by guides who have previously gone over the ground.

Tactics. Inasmuch as artillery has no independent rôle, its sole raison d'être is to assist the infantry. This it does by its fire action, although the moral support and encouragement arising from the mere action of the guns is not to be despised. It is a well-accepted principle of modern tactics that success is to be obtained only through offensive action. Even when taking up a defensive position, the question of counter attack is kept in mind. Now, offensive tactics imply an intention to advance and close with the enemy, and, if we except night attacks and bush warfare, this can only be accomplished after fire superiority has been gained. Both infantry rifles and the field guns are used to obtain this superiority, which, when won, permits a portion of the infantry line to cease firing and advance—two tasks it cannot do at the same instant. It is here that the artillery plays its part; for, by subjecting the hostile line to a well-directed shower of shrapnel, it will keep down the enemy's rifle fire and thereby relieve and assist its own infantry. But the hostile artillery also must be reckoned with. If left to its own devices, it will subject the attacking infantry to such a fire as the latter's guns are pouring into the defender's lines.

Assuming that the two artilleries are both ample and equally skillful, there is no relative gain to the infantry of either side. For this reason hostile artillery, especially when firing upon friendly infantry, must be engaged and, if possible, destroyed. This gives rise to the artillery duel, although in the modern practice of separating battalions and batteries, rather than establishing the guns in one line as was the custom during the last century, this will likely take the form of a number of separate although more or less coördinated artillery combats in which the success may vary at different parts of the line.

It is no longer practicable for the infantry to await the outcome of this artillery duel before starting its attack. Indeed, in many cases, especially on the part of the defense, the guns will remain silent—will not disclose themselves—until the infantry advances in force. Nor will there be much more reason for the premature opening of the attacker's guns, for it is doubtful if, prior to the advance of the attacking infantry, the defender's troops will have disclosed themselves sufficiently to justify the expenditure of ammunition. All agree, however, that the point selected for the assault must be subjected to the heaviest possible artillery fire while the infantry advances to the attack.

It is now considered both normal and necessary for the artillery to fire over the heads of its own advancing infantry, continuing this fire until the last possible moment. If stopped too soon, the defender's infantry, freed from the menace of shrapnel bullets which has caused them to hug the shelter of their trenches, or at least has materially reduced the effectiveness of their fire, will rise up and subject the oncoming infantry to the most deadly fire encountered during their advance. For this reason the Japanese infantry demanded that their artillery continue to fire beyond the limit of safety, preferring the smaller losses inflicted by their own guns to the deadly rifle fire which they knew would follow close upon the silence of the artillery.

At just what point of the infantry advance the artillery must cease its fire in order to avoid hitting its own attacking infantry line, is still open to discussion, depending as it does much upon accuracy of armament and skill in the service of the gun. Both the French and German regulations mention 300 meters from the enemy as the probable limit. Bethell, an eminent English author, thinks that this is far too great, and that under favorable circumstances, as where the trenches are on a rising slope, fire can be kept up until the troops are within 50 yards. It must be borne in mind that the British gun, firing an 18-pound shrapnel, is remarkably accurate. According to the law of probabilities and the error of the gun and fuse, the German shrapnel, fired at a range of 2500 meters, may burst anywhere within a zone 210 yards wide. The United States gun, which occupies an intermediate position for accuracy, for the same range, will burst all shrapnel within a zone 153 yards wide, and 96 per cent of the total number within 115 yards. Both these figures should be increased to allow for the excitement of battle.

The various targets and situations arising on the battlefield give rise to a classification of batteries, according to the duties immediately required of them, into *counter batteries*, those

TABLE OF FIELD GUNS, 1913

(Col. H. A. Bethell, *Modern Guns and Gunnery*, Woolwich, corrected to 1913.)

	U. S. America, 1902.	Argentine, 1908	Austria, 1905.	Belgium, 1905.	Brazil, 1904.	Bulgaria, 1905.	Chili, 1910.	China, 1912.	Denmark, 1902.	England, F. A., 1903.	England, H. A., 1903.	France, F. A., 1898.	France, H. A., 1913.
Calibre, inches	3	2.95	3.01	2.95	2.95	2.95	2.95	2.95	2.95	3.3	3	2.95	2.95
Weight of shrapnel, pounds	15	13.2	14.72	14.3	12.1	14.3	14.3	14.3	14.85	18.48	12.54	15.96	15.96
Number of bullets	252	295*	316+16	295	235	294	350	295	295	375	236	292	292
Number to the pound	36.6	50*	50 & 35	42	42	45	50	45	41.3	41	41	38	38
Whether H.E. shell carried	U.	Yes.	Yes.	Yes.	Yes.	U.	U.	H.E.	No.	No.	No.	Yes.	No.
Muzzle velocity, f.s.	1700	1665	1640	1640	1600	1640	1675	1640	1640	1590	1658	1730	1550
Muzzle energy, foot tons	300	254	275	266	215	266	278	266	277	324	239	334	265
Weight of gun, cwt.	7.1	6.5*	7	6.67	5.7	7.52	6.9	6.5	6.42	9	6	9	6.7
Weight of gun and carriage, cwt	22.3	18	20	20	16.3	20.25	20.2	18.5	20.5	24.75	19.5	22.4	18.9
Weight of gun and limber filled, cwt.	36.6	31.5	37.5	34.5	26.7	34.5	33.5	30.5	36.6	40	32.75	37	26.6
Springs or compressed air	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	A.	A.
Maximum elevation, degrees	16	15*	18	15	17	15	17	16	15	16	17	12	16
Traverse each way, degrees	4	3	4	3½	3	3	3½	3½	3½	3	3	3	3
Length of recoil, inches	50	48	51.5	51	44	50	57	51	54	48	48	43	52
Height of wheels	4' 8"	4' 3½"	4' 3"	4' 3¼"	4' 2"	4' 4"	4' 3¼"	4' 3"	4' 3"	4' 8"	4' 8"	4*	4' 3"
Track of wheels, inches	62	58	60	58	58	57	55	51	59	62	62	60	60
Line of sight, whether independent	No.	Yes.	No.	No.	No.	No.	Yes.	Yes.	No.	Yes.	Yes.	Yes.	Yes.
Sights—Goniometric, Telescopic, Panorama, or Ordinary	O.P.	T.G.	P.	P.	T.G.	O.	P.	P.	T.G.	T.G.	T.G.	G.	G.
Length of gun, calibres	29.2	30	30	30	28	31.4	30	29	30	29.4	24.4	36	31
Breech action—wedge, swinging block, or eccentric screw	S.B.	S.B.	W.	W.	W.	S.B.	W.	W.	W.	S.B.	S.B.	E.S.	E.S.
Thickness of shield, millimeters	5	4	4.5	5	4½	4	4	3	6	?	?	5	3½*
Traverse on pivot or axle	P.	P.	P.	P.	P.	A.	P.	A.	P.	P.	P.	A.	A.
Rounds in limber	36	32	33	40	32	38	30	32	44	24	24	24	Nil.
Rounds in wagon limber	36	32	30	40	40	38	30	32	48	28	28	24	12
Rounds in wagon body	70	56	60	61	40	60	60	55	72	48	48	72	?
Rounds per gun	358	296	168	242	192	332	210	163	284	176	176	312	?
Weight of wagon, packed, cwt.	37	30.6	38.5	35.3	34	34	33.5	31	39.4	36.75	30.5	38.5	27.5
Percentage of H.E. shell	?	?	33	?	?	20	U.	?	Nil.	Nil.	Nil.	11.5	Nil.
Number of guns in battery	4	6	6	4	4	4	4	6	4	6	6	4	4
Number of wagons in battery	12	18	9	8	8	12	8*	8	8	12	12	12	9*
Maker	State and Ehrhardt.	Krupp.	State, Skoda and Ehrhardt.	Krupp and Cockerill.	Krupp.	Schneider.	Krupp.	Skoda.	Krupp.	State, E. O. C. V. M. and C. O. W.		State.	Schneider.

The following abbreviations are used:—
Ammunition:—U = Universal shell. Sights:—P. = Panorama. T. = Telescopic. G. = Goniometric. O. = Ordinary.
Doubtful figures are marked *. In the Krupp guns the track is measured from centre to centre of each tire.
NOTES.—America: — 358 rounds per gun includes 4 rounds on gun carriage.
China:—The Skoda gun has been supplied to one province only.
France:—The high explosive shell weighs 11.68 lbs. only, M.V. 2050 f.s. The wagons containing H.E. shell weigh 3 cwt. less than those containing shrapnel.

designated to engage hostile artillery, and *infantry batteries* (including accompanying batteries), whose objective is the hostile infantry. Another class, *decoy batteries*, should be mentioned. These purposely expose themselves with a view to drawing fire, thereby learning the location of hostile guns; but no example of this last class can be found in the accounts of either the Manchurian or the Balkan war. This classification, first used by the French, has been dropped from their regulations, although the principle still exists with them, as it does to a greater or less extent with all other nations. These designations still appear in the drill regulations of the United States artillery.

TABLE OF FIELD GUNS, 1913 (*continued*).

(Col. H. A. Bethell, *Modern Guns and Gunnery*, Woolwich, corrected to 1913.)

Germany, 1906.	Greece, 1907.	Holland, 1903.	Italy, 1906.	Italy, 1912.	Japan, 1905.	Mexico, 1902.	Norway, 1900.	Portugal, 1904.	Rumania, 1904.	Russia, 1903.	Russia, H. A., 1913.	Servia, 1907.	Spain, 1906.	Sweden, 1902.	Switzerland, 1903.	Turkey, 1904.
3.03	2.95	2 95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	3	3	2.96	2.95	2.95	2.95	2. 95
15	14.3	13.2	14.3	14.3	14.3	13.64	14.3	14.3	14.3	14.45*	14.45	14.3	14.3	14.3	14	14.3
300	320	270	360	350	210	250	280	294	295	260	230	305	180	295	210	295
45	45	41.3	50	50	28.4	38	42	43	42	43	43	45	28	42	36.3	45
Yes.	Yes.	U.	Yes.	Yes.	Yes.	No.	No.	Yes.	U.	Yes.	No.	Yes.	Yes.	No.	Yes.	Yes.
1525	1640	1640	1675	1675	1700	1640	1640	1640	1640	1930	1666*	1640	1640	1640	1590	1640
242	256	245	278	278	288	255	267	267	267	373	278*	267	267	267	245	267
7.66	6.7	6.9	6.9	6.8	6.8*	6.5	6.5	6.67	7.37	7.85	6.9	6.6	6.67	6.7	6.48	6.77
19.3	21.3	19.5	19.75	20.6	19.7	20.8	19.75	21.25	21	20.75	19.75	20.4	20.4	19.15	19.75	21.1
35.5	35.5	34.7	33.45	34	33.25	36.3	36	35.5	34.8	38.5	32*	35	34.2	35.3	35.5	38
S.	A.	S.	S.	S.	S.	S.	S.	A.	S.	S.	A.	A.	A.	S.	S.	S.
16	16	16	17	45	29	17½	15½	16	16	16¼	16	16	16	16	16	16
4	3	3½	3½	25	3	2½	3½	3	3½	2¼	3	3	3	3½	2	3½
44	50	47	57	40	55	44	48	50	54	42.5	50	50	50	51	53	52
4' 5½"	4' 4"	4' 3½"	4' 3½"	4' 3½"	4' 3½"*	4' 3½"	4' 3½"	4' 4"	4' 3½"	4' 4"	4' 4"	4' 4"	4' 3½"	4' 3½"	4' 3½"	4' 3½"
60	61	58	58	58	55	60	55	61	58	60	60	61	61	58	55	58
No.	Yes.	No.	Yes.	Yes.	No.	Yes.	No.	Yes.	No.	No.	Yes.	Yes.	Yes.	Yes.	No.	Yes.
T.G.	G.	T.G.	T.P.	P.	T.G.	G.P.	O.	G.	T.G.	O.P.	P.	O.P.	G.	T.G.	O.	O.
27.3	31.5	30	30	30	30	30	31	31.4	30	30	31.5	30	30	30	30	30
W.	S.B.	W.	W.	E.S.	W.	E.S.	E.S.	S.B.	W.	S.B.	S.B.	S.B.	S.B.	W.	W.	W.
4	4	4	4	4	3.6	5	4	5	4	5	3½*	4.25	4.25	4.75	4.75	4
P.	A.	P.	P.	A.	P.	P.	P.	A.	P.	A.	A.	A.	A.	P.	P.	P.
36	38	40	32	32	36	36	36	38	24	36	12*	38	38	44	40	44
36	38	40	32	32	36	36	36	38	24	40	?	38	38	48	48	48
52	60	64	64	64	64	64	64	72	64	48	?	60	60	48	48	48
126	332	282	224	224	136	235	235	258	288	216.5	?	234	234	284	280	188
36.5	33	36.35	35	36	34.5*	36.5	40.5	37.4	34	38	32*	32	32	36.3	35.3	35.3
20.2	?	17.3	?	?	33	Nil.	Nil.	?	29.5	?	Nil.	?	20	Nil.	?	?
6	4	3	6	6	6	4	4	4	4	8	4	4	4	4	4	6
6	12	7	12	12	6	8	10	8	12	16	8	8	8	10	10	9
State.	Schneider.	Krupp.	Krupp.	Deport.	State.	St. Chamond.	Ehrhardt.	Schneider.	Krupp.	Putiloff.	Schneider.	Schneider.	Schneider.	Krupp.	Krupp.	Krupp.

Germany:—126 rounds per gun, in addition to 103 rounds per gun with light ammunition column. Also 6 H.E. shells per gun are carried in the battery store wagon.
Holland:—The 6-gun administrative battery is fought as two 3-gun batteries.
Japan:—The figures given refer to the 1905 gun. This will be superseded by the 1907 Arisaka gun.
Norway:—The shield weighs only 56 lbs., and is carried on the wagon.
Russia:—The ammunition includes 45 rounds per gun in the store wagon limber.
Spain:—The proportion of ammunition to be carried has been fixed at 64% shrapnel, 16% common, and 20% high explosive.

The Conduct of Fire from Aëroplanes. An important step in the development of artillery tactics has been the control of fire from aëroplanes. Several nations have made important developments along this line. In general, the practice is to direct the fire of concealed batteries against hostile artillery or other immobile troops so located and sheltered that they cannot be seen from the vicinity of the attacking guns. In this case the angle at the firing battery between the hidden target and some prominent aiming point is measured from the aëroplane at the moment it flies over the firing battery, and the result is communicated or signaled to the guns in some such way as by smoke flashes, messages dropped near the battery, or maybe by wireless telegraphy, in which latter method experiments have been made. The guns are then laid with different ranges, varying by 400 or 200 yards, say, 3000–3200, and fired at the instant the aëroplane crosses their line flying in the direction of the enemy, the flight in that direction being continued long enough to note the point of burst or strike of the projectiles. The results are signaled back as both short, both over, or bracketing, the necessary deflection and fuse connections being noted also. The next salvo can be corrected in the proper sense by an appropriate amount, and the process continued until a bracketing salvo is secured. This can be reduced to the desired bracket (usually 100 for a battery in action), and the guns can pass to fire for effect. The methods are necessarily slow and dependent upon the weather and the perfectly coördinated action of all concerned. Nevertheless, if batteries in future lie quite concealed like beasts waiting to spring unhindered upon advancing infantry lines, some method must be devised by which the attacking artillery can seek them out and cripple them before they in their hidden security play unmolested upon the advancing infantry. That this view is gaining ground is shown by the fact that German batteries in their manœuvres of 1913 took pains to conceal themselves from aviators by screening and covering the guns and *personnel* with boughs, and this was also the practice in the war of 1914.

A two-passenger machine is employed for the work, for it is beyond the power of one man both to pilot the machine and at the same time also communicate to the guns the results of the fire. It naturally follows that the observer should be an artilleryman, and it would seem that the battalion commander, because of his knowledge of the many technical and tactical considerations which will arise, as well as the fact that he is the commander of the tactical unit, the battalion, is the logical officer to be intrusted with this duty. The possibilities are great, and developments along these lines in the great war were watched with interest by artillerymen.

Several European manufacturers have produced a gun especially designed for the attack of air craft. One type (Krupp) is a 15-pounder with differential recoil and air recuperator mounted on portable platforms or motor cars. At 75° elevation it will send its projectile approximately 20,000 feet into the air. The use of the differential recoil so reduces the strains set up that a motor car can be used as the firing platform. Another and opposite type consists of a rapid-firing 6-pounder mounted on a swift motor car. This gun is designed to follow the air craft and by the swiftness of its movements and rapidity of its fire secure effect. The success of this type has been limited. A third and probably the most practicable type, at least the only one which has yet been incorporated into the armament of any nation, is a field gun with split trail which permits the breech to be depressed sufficiently to give the elevation necessary to attack air craft. The Italian (Deport) gun is of this type, and the United States in 1914 was engaged in the manufacture and test of gun carriages based upon this principle. This type fills the rôle of an ordinary field gun and in addition is suited for the attack on air craft.

Draft. Light field guns and howitzers are now drawn by six horses, as the experience of several centuries has demonstrated that three pairs of horses hitched in tandem mark the limit of economic artillery teaming. The width of roads and trails over which artillery must operate precludes hitching animals three abreast, as is done in commercial teaming; the pulling capacity of six horses determines the weight and, a priori, the power of the gun. Further experience has placed this capacity at 800 pounds per horse. So 4800 pounds must include the weight of the vehicle, implement, and members of the gun detachment. This limit is maintained in the case of the light guns and howitzers, but is not practicable in the case of the heavy guns and howitzers to which heavy horses are assigned. This latter type is not required to move with the speed of the light guns.

It would seem at first glance that the weight of ammunition carried in the limbers might be utilized in building a more powerful gun, but this would place an excessive weight upon the gun wheels, which would sink farther into the ground and thereby greatly increase the work of draft.

The horse most favored for this work is a compactly built, muscular animal, about 15 hands, 3 inches high, weighing approximately 1200 pounds. He varies somewhat from the type formerly preferred when dashing movements were in vogue, and handy horses, necessarily smaller and lighter than those described above, met with the favor of the artilleryman. Now, when the artillery seldom moves faster than a trot, which it must be prepared to sustain for several miles, the heavier, more powerful horse that is not compelled to strain himself is preferred.

The harness in the United States is what is known as continuous draft; i.e., the traces are attached so as to make one direct pull from the lead horse to the singletree. The Germans and many other nations make use of the splinter-bar system, by which each pair is hitched to its own doubletree or splinter bar. The advantage of continuous draft is that it admits of quicker movement and closer turning. Its corresponding disadvantage is that it exerts a downward tendency on the necks of the wheel horses, making necessary considerable care on the part of the drivers to avoid sores.

The wheels are made as large as considerations of weight and stability in firing will allow, this in order to reduce the work of draft. On the continent of Europe the wheels are considerably smaller than in England and the United States, where the diameter has been fixed at 4′ 8″. The better roads of continental Europe admit of this saving in material and weight.

Organization and Command. Artillery is now organized into batteries and battalions and in most armies into regiments and brigades. The basic unit of artillery is the battery of four or six guns, ordinarily commanded by a captain and subdivided into platoons of two sections, each containing one gun and one caisson (or two caissons) each. In English writings platoons and sections are termed sections and subsections respectively. With the exception of England, Germany, Russia, Italy, and Turkey, all nations have settled upon four guns per battery, although the transition has not yet been effected in Austria and Japan. The Russian battery consists of eight guns, commanded by a lieutenant colonel, but it is often tactically divided into two half batteries of four guns each. A battery in the United States army at peace strength consists of 5 officers, 133 enlisted men, and 120 horses. The war strength is 5 officers, 171 enlisted men, and 157 horses.

The reduction of the number of guns in the battery (six was the universally accepted number before the advent of the hydraulic recoil brake) is based upon the fact that four guns can be handled and fought far more skillfully than six. This is particularly true in locating battery positions. The rapidity of fire which is characteristic of the modern weapon is such as to make a heavy demand upon the ammunition supply. With the 4-gun battery the men and horses and (what is also of considerable importance) the road space required for the two other guns are utilized in providing additional ammunition wagons. Thus, in the United

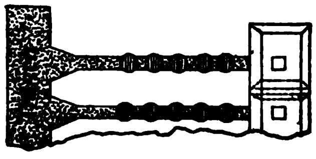
States service the 6 guns and 9 caissons which constituted the battery with the 3.2-inch gun, the immediate predecessor of the present weapon, have given place to 4 guns and 12 caissons, providing an ammunition supply of 358 rounds per gun, an increase of 127 rounds per gun.

Three batteries ordinarily constitute a battalion (British *brigade division*, French *group*, German *Abteilung*), under the command of a major, although the British brigade division is commanded by a lieutenant colonel. The regiment is composed of from two to four battalions and is commanded by a colonel. Two regiments constitute a brigade, the usual complement of a division in which there are from 12,000 to 16,000 infantry bayonets and which is the smallest complete army unit. In the British and Russian ármies the artillery organization does not extend beyond the brigade division (battalion), and with the French it ends with the regiment.

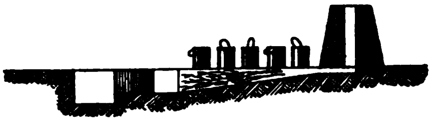
For a useful bibliography of field artillery, including both modern works and historical treatises, consult article ARTILLERY. See ARMY ORGANIZATION; TACTICS, MILITARY; ORDNANCE; PROJECTILES; ETC.; also the paragraphs on *Army* in the articles on the various countries.

FIELD BUG. A pentatomid. See STINK BUG.

FIELD COOKING. The method of preparing soldiers' rations in the field. Field kitchens are of two general descriptions, each type including the many varieties necessary to meet successfully the many contingencies of campaign service. 1. Troops having good facility of transport carry with them apparatus more or less elaborate, with which, particularly in the case of the United States army, meals can be prepared little, if any, inferior to those prepared in permanent posts. 2. Under circumstances less favorable recourse is had to various forms of trench ovens and cooking. In most armies this forms a distinct branch of instruction and with the general advance of military science and hygiene is receiving more than ever before its proper share of attention. In the United States company commanders are responsible for the selection of cooks, the kitchens being under the direct charge of specially trained noncommissioned officers. The cooks and n.c.o. in charge are usually graduates of the SCHOOL FOR COOKS AND BAKERS (q.v.). On campaign troops are supplied by the quartermaster's department with the field range, a rectangular, boxlike adaptation of the Dutch oven. There are two types: army field range, No. 1, weight 264 pounds, is designed to cook for 150 men; No. 2, weight 150 pounds, cooks for 55 men. Either may be carried on pack mules. Both are made of sheet iron. They are adapted for roasting, baking, frying, broiling, or stewing, easy of transportation and capable of compact packing. Where these are not available, troops are trained in the construction and use of the many improvised trench ovens in general use throughout all civilized armies. In the United States army cooking fires are prepared as follows: When fuel is plentiful, a trench about 1 foot deep is dug to hold the fire. Green poles or irons, resting on uprights of suitable height, support the camp kettles. If fuel is scarce, the trench is made somewhat narrower than the diameter of the camp kettles; the latter then rest on the ground, and the intervening spaces are covered with stones or clay, forming a sort of flue. The draft may be increased by widening the opening towards the wind and by building a chimney of sod or stones at the leeward end. The trench should have a slight fall from the chimney for drainage. Four such trenches radiating from a common chimney afford good draft, whatever the direction of the wind. When *bakeries* or *portable ovens* are not available, suitable ovens are improvised. A simple expedient is to lay an empty barrel on its side in a depression, knock out one head, and plaster the barrel over with six to eight inches of clay, and then cover with an equal thickness of earth. A flue of clay is constructed at the closed end of the barrel, which is then burned out, leaving an oven of baked clay. Improvised *incinerators*, for the disposal of garbage, are constructed as follows: A pit is dug about 5 feet long, 2½ wide, 6 inches deep at one end and 12 at the other; the excavated earth is banked around the pit, and the latter is then filled with stones on which the fire is built. Liquid matter is evaporated on the hot stones; solid matter is burned in the fire. A good type of the trench cooker is the broad-arrow form of trench used by the British army. Two, three, or more trenches are constructed, each joining a common chimney at different angles, the mouths of which, spray-shaped, are about 18 inches in depth, the trench itself being graded from the mouth to about 4 inches at the chimney. Earth excavated from the trench is used in building the chimney and packing round the pans, which are placed bridgewise across the trench, confining the heat and securing good draft. The advantages of this system are its independence of transport, only a pick and shovel being required for constructive purposes; little or no skill required on the part of the troops; and,



PLAN.



SECTION.

FIG. 1. FIELD COOKING TRENCH, United States Army.

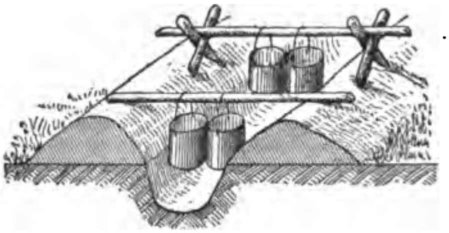


FIG. 2. FIRE TRENCH FOR FIELD COOKING, United States Army.

most important factor of all, a number of pans simultaneously served by one ordinary fire. The Army Service Corps of the British army kills and prepares the fresh beef, and bakes the bread used by the troops, regimental quartermasters receiving on requisition the rations which are prepared for consumption by the regimental cooks as above described.

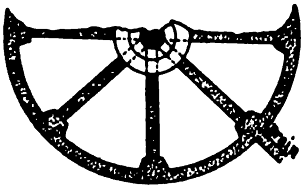


FIG. 3. BROAD-ARROW COOKING TRENCH, British Army pattern.

The armies of continental Europe have methods similar to the United States, French troops being additionally equipped for marching purposes with a small coffee kettle, which, together with a bundle of dried brushwood, is carried by two men of each section or platoon. When fatigued and halted for any length of time, coffee is made by them for the men of their section. In most of the great armies cooking stoves and ovens, fireless cookers, and soup caldrons, carried on carts or in wagons, are operated while on the march, so that the hot food is ready for the men upon their arrival in camp. One of the best descriptive and comprehensive authorities on this subject is the *United States Manual for Army Cooks and Bakers*, published by the War Department (1910).

FIELD DOG. One of a distinct class of dogs which aid men in the capture of game birds afield; bird dogs. The group comprises pointers, setters, retrievers, and the Chesapeake Bay dog; also, incidentally, some spaniels (described under SPANIEL). The function of these dogs is to range the field in front of the hunter and to determine by scenting the presence of the birds sought. When a pointer has located a bird or birds, he will indicate or "point" it by stopping short with nose directed towards the spot where the game is, and he will not stir until the gunner comes up to him, when he will on order, if it be necessary, go yet nearer to the birds until they become so alarmed as to rise from their cover and expose themselves to the gun. If a setter is used, he will do the like, but, instead of maintaining an erect position, he will crouch or "set," as an indication of the bird's presence. The retriever is mainly sent into the cover after birds which have been shot but have fallen at a distance and are out of sight. He scents them out, gently picks them up, and brings them to his master.

The Setter. Three breeds of setters are recognized: 1. The English, which is white speckled dispersedly with larger or smaller portions of black, each color standing out from the other well defined and distinct. The English setters are divisible into two main strains, the Laveracks and the Llewellins. 2. The Gordon setter, which is a rich, glossy plum black, with deep sienna or dark mahogany-tan markings on lips, cheek, throat, and on feet and legs. 3. The Irish setter, which is uniformly colored a rich golden chestnut. The English setter has an authentic history as far back as 1555, when Robert Dudley, Duke of Northumberland, is recorded as using the setter when netting birds. The date of the origin of the Irish is more doubtful, but Gervase Markham, writing his *Art of Fowling* in 1621 and dealing with the question of the setter's colors, does not mention it. The Gordon was produced in the kennels of the Duke of Gordon about the year 1820. The setters are handsome dogs, weighing from 48 to 60 pounds (the bitches 8 to 10 pounds lighter), with soft, silky hair on the body, fringing longer on the belly and behind the legs, and longer still (the "feather") on the under part of the tail, which tapers down, however, to a point. The hair may slightly wave, but never curl. In form they are exceedingly artistic and graceful and in temper obedient and gentle. The head of the setter is peculiar to itself—long and keen, with a good depth from the bridge of the nose to the lower part of the lip. The shoulders should not be so heavy as to interfere with their full and free action, yet the bones should be strong and the legs well muscled. Catlike feet, well covered with hair, are desirable. The tail, or "flag," is one of the most striking features. It should be carried straight out without the least inclination to turn up over the back.

The Pointer. There are many varieties of pointers—English, Spanish, Portuguese, Russian, French, and Dalmatian (see COACH DOG), varying only, however, in size from the heavy, huge Spaniard to the diminutive Frenchman. The English and American dogs are the typical pointers. Short-coated, rat-tailed, cat-footed, without an atom of hairy padding on them, strong-boned, tight-muscled, upright, bright, great goers, and keen-scented, they are models of all a field dog should be. Though not so large now as he was in earlier days, the modern pointer is of good size, weighing generally from 50 to 55 pounds. The points of a typical specimen of this breed should include a head moderately large, wide rather than long, with a high forehead and an intelligent eye; the muzzle should be square in front; the neck long and free from dewlap or ruff; the body should have a strong loin, wide hips, and a chest well let down; a tail strong at the root and growing finer to within two inches of the tip, when it decreases to a sharp point (an unfailing indication of true pointer blood). The shoulders should be long, slanting, and powerful, the legs strong, and the feet thick-soled; muscular haunches and thighs, well-bent stifles, and large, strong hocks. In color pointers vary very much. The most usual combinations are liver and white, yellow and white, and black and white. There are some whole-colored black ones, but a good admixture of white is preferable, so that the dog may be easily distinguished when he is ranging in cover.

The Retriever. This dog is most useful when the birds are aquatic or are such as haunt sloughs, from which he will gather in the killed or wounded with unerring nose. There are mainly two kinds, the English and the American, or Chesapeake Bay, dog. The English variety has been generated mainly by crossing two other breeds, such as the spaniel and Newfoundland, or the spaniel and poodle, one breed tough-skinned and stiffly coated, and both dogs of remarkable powers of scenting. The rest is a matter of training. There are two distinct strains of the English retriever, the curly-coated black and the flat or wavy-coated. The latter has the appearance of a heavily made, somewhat clumsy setter, with more bone and substance than is required in a fast field dog. The former has the body covered with short curls, though the head is smooth. The curly variety may be either black or liver-colored. Each weighs from 55 to 68 pounds. As the function of this dog is to carry dead game, the jaws should be long and strong; and that his scenting powers may have full capacity the nose should be wide, the nostrils open, and its end moist and cool.

The Chesapeake Bay dog is the American retriever pure and simple. The origin is problematic, but he derives his name, like the Newfoundland, from the home where he first became famous. He is the finest retriever in the world. No sea is too boisterous, no water too cold, no bird too big, from a Canada goose to a swan, and no wounded bird, be he diving duck or crippled woodcock, can escape his nose and swimming skill. He is a large dog, weighing 65 pounds, with a thick, short, coarse, sedge-grass-colored coat about 1⅛ inches in length, and with a tendency to wave over the shoulders, back, and loins, and underneath this a short woolly fur covering the whole skin. His legs are somewhat short, and he is provided with well-webbed feet.

Griffon. The Germans have a field dog which they consider superior to either the pointer or setter, inasmuch as he is capable of taking the place of both those breeds. It is called "griffon" and sometimes "bassett griffon." It is a very robust dog, with a rough, hard coat that undoubtedly is a great protection to it in a district where the undergrowth is thick and low; stands rather higher than the setter, and in color is a grizzly liver. The griffon made its first show appearance in America at the Westminster Kennel Club's Show at New York in 1901. See DOG, and consult the authorities there mentioned; and Plate of HUNTING-DOGS.

Dog Breaking. The field dog is a hunter by nature, but before being required to exercise his faculties to scent and locate game and yet refrain from catching it, he must be specially trained. This training begins with yard breaking, in which the puppy is taught to remain quiet in confinement and to become accustomed to collar and chain. His subsequent field education will depend upon his breed. Spaniels, pointers, setters, and retrievers all have different functions to perform, viz., spaniels are expected to flush their game; pointers and setters not to do so, nor are they usually expected to retrieve it, as retrievers are employed for that purpose. The most important general principle is to establish the habits of obedience and confidence, after which the dog is taught to keep at the hunter's heel until, if he be a spaniel, pointer, or setter, he is sent forward. Then he must quarter or range over his field only within certain limits of the gunner, and on signal must not exceed this limit. The next step is to inculcate the knowledge that (except in the case of a spaniel) when he has located the birds he must not flush them. To teach him to "down" is a comparatively short process with the average well-bred dog, and keeping to heel is as easily learned. Most dogs will range when told; all they need is a direction as to where they should begin. The dog under training should be started always against the wind, that he may catch the scent. The lessons to be impressed on him are to stop when signaled, to return, and to start again. When a puppy first flushes a covey of birds, he will usually proceed to chase them—a fault which is corrected by taking him back to the exact spot where he should have stopped and dropping him to hand; he will thus gradually learn to drop to wing. If a perfectly seasoned and steady dog is available when the puppy is being taught to back, it will be found to expedite the training greatly.

Field trials are competitions over definite areas, before competent judges, who follow the dogs and gunners over a game country and award prizes according to the points of merit established by each dog in the class for which it is especially fitted by nature and training. These trials include other dogs. The fox hound and the beagle as well are tried out after their respective quarries. Consult: Hutchinson, *Dog-Breaking* (London, 1865); H. H., *The Scientific Education of the Dog for the Gun* (ib., 1890); *Field-Dog Stud Book*, vols. i–v (New York, 1901–05); Hochwalt, *The Pointer and the Setter in America* (Cincinnati, 1911); Barton, *Sporting Dogs* (New York, 1910); id., *Gun Dogs* (London, 1913); Shaw, *Encyclopedia of the Kennel* (New York, 1913).

FIELD ENGINEER SCHOOL, UNITED STATES ARMY. See ENGINEERS, CORPS OF.

FIELDFARE (from AS. *feld*, field + *faran*, to go). A thrush (*Turdus pilaris*) of northern Europe, visiting Great Britain and the Mediterranean countries in winter and going in summer to breed in Scandinavia. The general color of the male is gray, the feathers tipped with a brownish-black elongated spot; the throat and breast reddish yellow, streaked and spotted with black; the fore part of the back and wings rich chestnut; the tail slightly forked and nearly black; the underparts white. It may generally be found in small flocks—in fields, if the weather is mild, feeding on worms, snails, etc., or in severe weather, about hedges, thickets, and woods, wherever haws and other such fruits or seeds are abundant. It is extremely plentiful in Norway in summer, where its nests are built in birches and firs, and, contrary to the ordinary habits of thrushes, in society, numerous nests being often found in the same tree. The fieldfare is easily tamed and sings well in captivity, the song being melodious but not brilliant.

FIELD GLASS. A small binocular telescope constructed so as to have considerable magnifying power and at the same time to be extremely portable. It is a Galileo's telescope with a large achromatic object glass to secure a brilliantly lighted image, and an achromatic eyeglass which is negative or concave. The magnifying power of the field glass is ascertained by dividing the focal length of the objective by that of the eyepiece; consequently the magnifying power of such a glass is limited by the length of tubes which can be used. To obviate long tubes field glasses are now constructed where, by an arrangement of reflecting prisms placed within the tubes, the ray traverses to and fro, and the advantages of a long focal length in small compass are obtained. Field glass is a term also applied to the lens interposed between the object glass and eyeglass of a microscope, which, receiving the diverging rays from the former before they form an image, causes them to converge and thus contracts the dimensions of the image and increases its brightness, so as to render it of such a size and degree of distinctness that the whole of it may be viewed by means of the eyeglass. See Microscope.

FIELD GUN. See Field Artillery; Ordnance.

FIELD'ING, Anthony Van Dyck Copley, known as Copley Fielding (1787-1855). A British water-color painter. He was born in Yorkshire and studied under his father, a portrait painter, and later under John Varley. He contributed very largely to the exhibitions of the Society of Painters in Water Colors, of which he was an influential member, and president from 1831 until his death. He is especially noted for his effects of light and mist and found an ardent admirer in Ruskin, who was his pupil. His best work is his landscapes of the Sussex Downs and storm scenes at sea, but his early drawings of Scottish, Welsh, and north English lake and mountain scenery were also very popular. As a teacher, he was much sought after. In later life his work declined, but he was, nevertheless, one of the most distinguished of English water-colorists. The South Kensington Museum contains 18 water colors and one oil painting by him.

FIELDING, Henry (1707-54). An English novelist, not improperly called the father of the modern novel. The son of Gen. Edmund Fielding, he was born at Sharpham Park, near Glastonbury, in Somersetshire, April 22, 1707. He belonged to the younger branch of the earls of Denbigh, and his aristocratic spirit showed itself in many of the political controversies of later life. Life at Eton was followed, thanks to a youthful escapade, by two years' attendance at the University of Leyden, where he studied law. On returning to England it was necessary for Fielding to win his way for himself, as his father was richer in children than in more material treasure. He determined on play writing and for 10 years contributed generously to the stage, beginning with a few comedies of the Congreve school. Some 25 plays make up the total of this period, but none of them were striking examples of dramatic art. They did contain, however, sufficient political satire to give rise to the Lord Chamberlain's censorship of the drama. The interest of the dialogue in parts, and the humor which one so readily associates with Fielding, are not lacking in them, while the plots of many show that he had the story-teller's gift; but on account of a desire to adapt his plays to the taste of the times, and an inability to comprehend as well as to rise to the heights of dramatic possibility, his dramatic work is forgotten. *Love in Several Masques* has an historical interest, as it was the first to be produced (1728), and so introduced Fielding to the public; while *Don Quixote in England* is worth at least a mention, as it suggests his liking for Cervantes. To Cervantes Fielding looked back as afterward Thackeray looked back to Fielding, and as we read *Don Quixote*, *Joseph Andrews*, and, say, *Henry Esmond*, we note how the warm, genial, honest blood runs truly and similarly through the veins of these authors. All three have insight into men's characters, and power to see beneath the surface of life alike high and low; all three have the saving grace of humor, the sincere hatred of hypocrisy, the pleasant faculty of personal interpolation and friendly interpretation of men and things. The two Englishmen, indeed, lacked the genius for noble idealization which Cervantes possessed; but all three were optimists in a world whose evil they plainly discerned and described, and the winningness of their work is not lessened by that splendid power of satire which in Thackeray and Fielding was directed against the affectations and hypocrisy of their own times and society, exposing the ridiculous in life, while in Cervantes it dealt more nearly with what pessimists look upon as the satire of the universe, the seeming futility of ideal endeavor.

Fielding's reputation rests most firmly on four novels: *Joseph Andrews* (1742); *Jonathan Wild* (1743); *Tom Jones* (1749); and *Amelia* (1751). *Joseph Andrews* was planned to be a parody on Richardson's *Pamela*, the sentimental, moralizing novel in which the poor heroine is rewarded for her virtuous resistance to the nobleman, her lover, by the offer of marriage, which Fielding suggests may have been one of the motives of her chastity. Joseph Andrews, the handsome, pure-minded footman, was, as brother of Pamela, to parallel his sister's virtuous conduct; but before the story had progressed far the author became so interested in the characters he had set in motion that the parody purpose was set aside, and the novel developed as an original and independent work of fiction. Parson Adams, the stalwart, confiding, simple-minded, and high-minded curate, is one of the most engaging persons that eighteenth-century literature has bequeathed to us, while the description of the inns and of the life of the road, again reminiscent of Cervantes, are vivid to the point of reality. The faculty of description was Fielding's, and if often we miss the intense emotional treatment or the sympathetic delineation of the spiritual element in man's activity, it is still good to listen to the exposition and to the comments of one whose common sense allowed no dimming of his perception, and whose manly nature and warm heart would not permit poverty, the animosity of enemies, or sickness to warp his judgment. His writings are, therefore, graphic and illuminating, and though they are not loftily inspiring because of their lack of certain finer sympathies, a pervading healthiness of tone and a sense that we are receiving a full and frank report upon human nature as the author saw it, are a sufficient apology for the broad speech that so often rings unpleasantly in the sensitive modern ear. His own experience crops up unmistakably in his books, and Tom Jones has well been called "Fielding in his Youth," as Captain Booth is "the Fielding of later years." The looseness of many of the scenes and the coarseness of much of the language of his novels are indicative, therefore, not alone of a lax society, but also of a life in which there was a good share of rioting and carousal. The final words of praise to be said of Fielding's novels are that they possess the unity of plot which differentiates them from such structureless work as that of Smollett, while the remarks and criticisms embedded in them have much of the wisdom and the wit that one looks for and finds in Montaigne. It is the lack of opportunity in dramatic compositions for such personal running commentary and maxims that partially explains the comparative failure of Fielding as a playwright.

Fielding married in 1737. It did not take him long to use up his wife's fortune in extravagant living as a country squire, and so in 1740 the law was taken up as a means of livelihood. No success followed his legal studies, and the author went back to his pen and paper. *Jonathan Wild* (published in his *Miscellanies*, 3 vols.) appeared in 1743. It is a great book—a powerful satire, as unreasonably neglected as its literary descendant, Thackeray's *Barry Lyndon*. Saintsbury makes bold to compare it favorably with *The Tale of a Tub* and declares that, in his opinion, its author "has written no greater book" (introduction to *Jonathan Wild*, London, 1898). It was the year of the publication of this novel (1743) that saw also the establishment of the *True Patriot*, a semipolitical journal edited by Fielding, succeeded by the *Jacobite Journal*. The services of these journals 1745-48 to the Hanoverian cause resulted in the author's appointment to the position of justice of the peace for Westminster, a reward due to the good offices of Lord Lyttelton, a lifelong friend. Until his death at Lisbon, in 1754, Fielding administered the duties of his position honestly and zealously, as all may learn who will take up his *Journal of a Voyage to Lisbon* (published posthumously). Nor is this hard to understand, for he had himself tasted the many flavors of the cup of life; and such men are the best judges, unless they have grown bitter with the bitterness that is never wholly absent from the draft.

Though Fielding died comparatively early, his career was varied and his achievements lasting. Playwright, country squire, editor, novelist, man about town, stage manager, political pamphleteer, magistrate—all these parts he played, showing in them all the qualities which make it easy to understand the censure that has attended his life, but showing also those characteristics which justify the affection that all must feel for him whom Thackeray called "the manly, the English, Harry Fielding."

Bibliography. The first collected edition of Fielding was *Works* (London, 1762); other editions are those edited respectively by Scott and Roscoe (Edinburgh, 1840), by Browne (London, 1871), by Gosse (New York, 1898), and by Saintsbury (New York and London, 1902). Fielding's first biographer was Arthur Murray, whose essay on Fielding's life and genius was introduced in the first collected edition. (See above.) The best life is that of Austin Dobson (London, 1883). Consult: Lawrence, *Life and Times of Fielding* (ib., 1855); Leslie Stephen's admirable essay on Fielding in *Hours in a Library* (ib., 1874-79) and his article on Fielding in the *Dictionary of National Biography*, vol. xviii; Linder, *Henry Fielding's Dramatische Werke* (Dresden, 1895). Full and excellent critical introductions to each of Fielding's important works will be found in G. E. Saintsbury's edition of the *Works* (10 vols., London, 1898).

FIELDING, Sarah (1710-68). An English novelist, sister of Henry Fielding (q.v.). She wrote *The Adventures of David Simple* (1744), which in order of time is the third English novel of manners, and to which her brother contributed a preface. In 1762 she translated Xenophon's *Memorabilia* and *Apologia;* and she wrote also *The Governess* (1749), *Lives of Cleopatra and Octavia* (1757), and, with Miss Jane Collier, *The Cry: A Dramatic Fable* (1754).

FIELDING, William Stevens (1848-). A Canadian statesman. He was born at Halifax, Nova Scotia, and was educated at the public schools of that city. In 1864 he became a reporter on the Halifax *Morning Chronicle* and later managing editor of that journal. He was elected a Liberal member of the Nova Scotia Legislative Assembly in 1882 and in the same year declined the provincial premiership offered to him by the Liberal Convention, but later became a member of the ministry formed by William Thomas Pipes. On the resignation of the latter in 1884, Fielding became his successor, retired from active journalistic work, and filled the position of Provincial Premier until 1896. In that year he was elected to the House of Commons and was appointed Minister of Finance in the Liberal administration of Sir Wilfrid Laurier. His tenure of that office for 15 consecutive years was unprecedented in Canada. In 1897 he introduced a measure which, while not repealing the moderately protective duties adopted by the Conservative party in 1879, imposed higher duties on luxuries and lower on necessaries. Its most notable feature, however, was the preference whereby in 1900 certain kinds of British manufactured goods were admitted at rates lowered by 33⅓ per cent. Fielding also secured the arrangement of the tariff according to maximum and minimum schedules, and the enactment of an "antidumping" law preventing the entrance of foreign goods into the Canadian market at unfairly cheap prices. He was a delegate to the Colonial Conference in London in 1902 and to the Imperial Conference in that city in 1907. In the latter year, in conjunction with the British Ambassador at Paris, he negotiated the Franco-Canadian Commercial Treaty; in 1909 the Supplementary Treaty (with France); and in 1909-10 commercial arrangements with the United States, Germany, Italy, and Belgium. As Acting Minister of Railways, he had charge in 1903 of the negotiations resulting in the agreement to build the National Transcontinental Railway; he was appointed (1909) a member of the Royal Commission on improved trade between Canada and the British West Indies and was a delegate (1910 and 1911) to Washington in behalf of reciprocity with the United States. He procured various beneficial amendments to the banking and insurance acts. In 1901 he established a branch of the Royal Mint at Ottawa and in 1903 the penny-bank system. He declined knighthood in 1902. After the defeat of the Laurier administration in 1911 he remained the chief financial authority of the Liberal opposition.

FIELD KITCHEN. A military term denoting the place in camp where soldiers' rations are prepared. To what extent the kitchen will be furnished will depend on the permanency of the camp and the character of the undertaking or campaign. In the field the individual mess kit of a United States soldier is limited to one tin cup, knife, fork, and spoon, and meat can with handle, furnished by the Ordnance Department. The meat can may be used for individual cooking. The kitchen may be furnished as described under Field Cooking, or the camp may be sufficiently permanent in character to admit of the employment of field ranges and ovens. See Field Cooking.

FIELD LARK. In the United States, the meadow lark (q.v.). In Great Britain, the skylark or the pipit. See Titlark.

FIELD MARSHAL. A military title of the highest rank in the armies of England, Germany, Austria, Russia, and Sweden. The rank is more nominal throughout continental Europe than in Great Britain, it being occasionally bestowed by one nation on the ruler of another. In the year 1818 the Duke of Wellington was field marshal in the armies of Austria, Prussia, and Russia. The rank was abolished in the French army in 1848. A lieutenant field marshal in Austria ranks as a general of division. The insignia of rank for a field marshal is the baton. In England the pay of the field-marshal commander in chief is £5000 per annum. In the spring of 1914 the following personages bore the title bestowed by the English government: the German Emperor, the Emperor of Austria, Duke of Connaught, Earl Roberts, Earl Kitchener of Khartoum, Lord Grenfell, Lord Methuen, Lord Nicholson, Sir Henry Brownlow, Sir Evelyn Wood, and Sir J. D. P. French, the last named resigning in the same year as chief of the Imperial general staff on the occasion of the agitation over the Ulster question. See Rank and Command.

FIELD MOUSE. See Mouse.

FIELD OF BLOOD (It. *Campo di Sangue*). A name given to the battlefield of Cannæ (q.v.).

FIELD OFFICER. A military title applied to all officers above the rank of captain or company officer and under the rank of general officer. Commissioned officers may be divided into four general classes: general, staff, field, and regimental. The term "*regimental field* officer" includes all officers qualified by rank and assignment to command a battalion or regiment. They are always mounted. See Army Organization; Rank and Command.

FIELD OF FORCE. See Force; Magnetism; Dynamo-Electric Machinery; Electricity.

FIELD OF LIES, or Lügenfeld. The plain of Rothfeld, near Colmar in Alsace, where in June, 833, Louis the Pious (q.v.) was shamefully deceived by his sons.

FIELD OF MARCH. See Champ de Mars.

FIELD OF MAY. See Champ de Mars.

FIELD OF THE CLOTH OF GOLD. The name given in English and French history to the place of meeting and interchange of civilities between Henry VIII of England and Francis I of France, from June 7 to June 24, 1520. The meeting occurred on a plain between Guisnes and Ardres in the present Department of Pas-de-Calais. The name originated in the gorgeous trappings and apparel of the participants and the splendor of the pageantry in the jousts and banquets which took place. Politically the meeting of the two kings was without result. Francis I indeed sought the aid and friendship of the English King against Charles V of Germany and had proposed to raise the English favorite, Wolsey, to the papacy if this result were accomplished. The meeting on the Field of the Cloth of Gold was followed by interviews between Charles V and Henry VIII at Gravelines and Calais, which more than offset the previous meeting of Henry with Francis. Shakespeare in *Henry VIII*, Act i, Scene 1, has put into the mouth of the Duke of Norfolk a graphic account of the encounter on the Field of the Cloth of Gold. Consult: Brewer, *The Reign of Henry VIII* (London, 1884); Ewald, *Studies Restudied* (ib., 1885); Martin, *Histoire de France*, vol. vii (Paris, 1856); Pardoe, *The Court and Reign of Francis I* (London, 1887).

FIELD OF VIEW. The space within which objects can be seen through an optical instrument; more strictly, the area from within which the pencils of light unite to form a real image.

FIELD PLOVER. In the United States, the local name of three different shore birds: (1) the Bartramian sandpiper (*Bartramia longicauda*), frequently called "upland plover," though not a plover at all; (2) the golden plover; and (3) the black-bellied plover. See Plover; Sandpiper.

FIELDS, Annie Adams. See Fields, James Thomas.

FIELDS, James Thomas (1817–81). An American author and publisher. He was born in Portsmouth, N. H., and was educated in the public schools of that place. In 1834 he removed to Boston, and in 1839 he became junior partner in the publishing firm of Ticknor, Reed, and Fields, in which he later became the controlling partner. His charming personal qualities, his sympathy, his liberality to all with whom he dealt, and his sound literary judgment drew to him most of the best-known American authors of the time, and he became the publisher of Longfellow, Hawthorne, Emerson, Holmes, Whittier, and Lowell, besides introducing Tennyson and Browning to American readers even before their true worth was recognized in England. He edited the *Atlantic Monthly* from 1862 to 1870. The last 10 years of his life were spent in authorship and lecturing. His own published works include: *Poems* (1849; 2d ed., 1854); *A Few Verses for a Few Friends* (1858); *Yesterdays with Authors* (1872; 2d ed., 1900); *In and Out of Doors with Charles Dickens* (1876); *Underbrush* (1877), a volume of essays. He also edited, with Edwin P. Whipple, a *Family Library of British Poetry* (1878). Consult: Annie Adams Fields (his wife), *Memoir of James T. Fields, by his Wife* (Boston, 1881); also her *Authors and Friends* (ib., 1896).—Annie Adams (1834–1915), his wife, was born in Boston Mass. Her publications include: *Asphodel* (1866); *Under the Olive* (1880), a collection of verse; *How to Help the Poor* (1883); *A Shelf of Old Books* (1894); *The Singing Shepherd, and Other Poems* (1895); the *Life and Letters of Harriet Beecher Stowe* (1897); *Nathaniel Hawthorne* (1899); *Orpheus, a Masque* (1900); *Charles Dudley Warner* (1904).

FIELDS, John Charles (1863–). A Canadian mathematician. He was born in Hamilton, Ontario, and was educated at the Hamilton high school and Toronto University, where he graduated in 1884 with the highest honors in mathematics. He afterward studied at Johns Hopkins University. In 1889–92 he was professor of mathematics in Allegheny College, Meadville, Pa., and in 1893–1900 he studied in Paris, Göttingen, and Berlin. In 1902–04 he was special lecturer in mathematics in Toronto University and in 1905 became associate professor. He is the author of papers in the journals of various American and foreign mathematical societies. In 1909 he was made a fellow of the Royal Society of Canada. He published *Theory of the Algebraic Functions of a Complex Variable* (1906).

FIELD SERVICE REGULATIONS. A military manual, for the guidance of armies, embodying the principles of war and their application in the field. All modern armies publish such regulations from time to time, either under this or other titles. The purpose, character, and contents of the *Field Service Regulations, U. S. Army* (1914), is indicated in the following introduction to that book and in the titles of the parts into which the book is divided.

"The following Field Service Regulations, revised by the General Staff of the Army, are approved and published for the information and government of the Regular Army and the Organized Militia, and in time of war, the Volunteer forces. Success in war can be achieved only by all the branches and arms of the service mutually helping and supporting one another in the common effort to attain the desired end. The basic principles of the combat tactics of the different arms are set forth in the drill regulations of these arms for units as high as brigades. It is the function of higher troop leading to so combine and coördinate the combat tactics of all the arms as to develop in the combined forces the teamwork essential to success. While the fundamental principles of war are neither very numerous nor complex, their application may be difficult and must not be limited by set rules. Departure from prescribed methods is at times necessary. A thorough knowledge of the principles of war and their application enables the leader to decide when such departure should be made and to determine what methods should bring success. Officers and men of all ranks and grades are given a certain independence in the execution of the tasks to which they are assigned and are expected to show initiative in meeting the different situations as they arise. Every individual, from the highest commander to the lowest private, must always remember that inaction and neglect of opportunities will warrant more severe censure than an error in the choice of the means."

Synopsis of Table of Contents F.S.R., U. S. Army, 1914. *Organization:* Land forces of the United States, coast defense, oversea departments, tables of organization.* *Operations:* Information, security, orders, marches and convoys, combat, shelter. *Administration:* Service of the interior, service of the theatre of operations, the zone of the advance, the zone of the line of communications, transportation by rail, military police, censorship, field post office. *Appendices:* War strength in round numbers, road spaces, and dimensions of camps. Semipermanent camps, types of field intrenchments, forms of field orders, field maps and sketches, distinguishing flags and lanterns, extracts from international conventions and conferences, miscellaneous data, signals and codes. See STRATEGY; TACTICS; WAR.

FIELD SPANIEL. See SPANIEL.

FIELD SPARROW. A small sparrow (*Spizella pusilla*), common through the northern half of the United States in summer and going south in winter. It closely resembles the chipping sparrow in size and color, except that where that species is ashy this is suffused with brownish. It nests on or near the ground in fields and meadows, lays spotted eggs, and has a slender, pretty song, as if in weak imitation of the song sparrow. A Western form (*Spizella pusilla arenacea*) has been separated, living in the Great Plains region.

FIELD SPORTS, or TRACK ATHLETICS. The various sports and competitions practiced in the open air (usually on a prepared track or course), and included under the general description of field sports, are principally as follows:

One hundred yards dash	(100 yards dash)
Two hundred and twenty yards dash	(220 yards dash)
Four hundred and forty yards dash	(440 yards dash)
One-half mile run	(880 yards run)
One thousand yards run	(1000 yards run)
Running one, two, and five miles	(1, 2, and 5 miles)
One hundred and twenty yards hurdle	(120 yards hurdle)
Two hundred and twenty yards hurdle	(220 yards hurdle)
Sack racing	(on the flat)
Sack racing	(over hurdles)
One mile walk	(1760 yards walk)
Running broad jump.	
Running high jump.	
Pole vaulting	(for height)
Pole vaulting	(for distance)
Throwing the sixteen pound hammer	(16 lbs.)
Throwing the fifty-six pound weight	(56 lbs.)
Throwing the discus.	
Putting the sixteen pound shot.	
Bicycling, from one-quarter to five miles	(440 yards–5 miles)

Other outdoor sports, such as cricket, football, fox hunting, golf, curling, lacrosse, paper chase, etc., will be found described under their proper titles.

In 1884 the title of *All-Around Athletic Championship of America* was instituted, the programme of which consists of 10 events: the 100-yard dash, running high jump, running broad jump, pole vault, throwing 16-pound hammer, putting 16-pound shot, throwing 56-pound weight, 120-yard high hurdle race, half-mile walk, and one-mile run. The competitor scoring the highest percentage in the 10 events wins the title of All-Around Champion. Competitions are held annually. See ATHLETICS. The following measurements have been laid down as a fair average of what the proper dimensions of an all-around athlete should approximate:

HEIGHT		Weight	Chest	Waist	Hips	Thigh	Calf
ft.	ins.	lbs.	ins.	ins.	ins.	ins.	ins.
5	6	120	35	27	34	20	13½
5	8	140	37	28	35½	21	14
5	10	155	39	29	37	22	14½
6		168	40	31	38	23	15

FIELD WORKS. Temporary devices, usually of earth, for immediate use, designed to increase the fighting power of troops occupying a position. See FORTIFICATION.

FIELITZ, fē′lits, ALEXANDER VON (1860–). A German composer, born of Polish parents at Leipzig, Dec. 28, 1860. He studied piano with J. Schulhoff and composition with E. Kretschmer in Dresden. From 1887 to 1897 he lived in Italy, mostly in Capri, for the sake of his health. After his return to Germany he was for some time a teacher in Stern's Conservatory in Berlin. In 1905–08 he taught at Ziegfeld's Conservatory in Chicago, and also conducted the Chicago Symphony Orchestra, organized by himself and not connected with the orchestra of the same name (which then was the Theodore Thomas Orchestra). In 1908 he returned to his position at Stern's Conservatory. He is chiefly known as a composer of songs, of which the two cycles *Mädchenlieder* and *Eliland* are the best known. He also wrote some pieces for piano, two suites for orchestra, and two operas, *Vendetta* (1891) and *Das stille Dorf* (1900).

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* The *Tables of Organization, U. S. Army* (1914), giving all details, are published in a separate pamphlet.

FIERABRAS, fyȧ'rȧ'brȧ', or **FERUMBRAS**. A paladin of Charlemagne, whose name gave the title to various romances of the fourteenth and fifteenth centuries. One version appears in Caxton's *Lyf of the Noble and Crysten Prynce, Charles the Grete* (1485). Fierabras carried away from Rome the crown of thorns and the balsam with which the body of Christ was embalmed and which possessed healing properties of the greatest efficacy.

FIER'DING COURT, or **THING** (Scot. *ferding*, farthing, fourth part, from AS. *féorþing*, *féorþling*, farthing, from *féorþing*, fourth). A district court of civil jurisdiction and of a popular character which existed among all the Germanic nations of western Europe before the establishment of the feudal system. There were usually four of these courts in every "hundred," and their jurisdiction extended to all causes where the matter in dispute did not exceed the sum of three marks, or 40 shillings. There are no traces of this court in English history after the Conquest, but it probably survived in the court baron or manorial court of a later day. All of those local and popular tribunals in course of time gave way before the advance of the national organization for the administration of justice. See CURIA REGIS.

FIERI FACIAS, fī'ê-rī fā'shī-ăs (Lat., cause to be done). One of the most ancient writs known to English law, taking its name from two leading words in the mandatory clause of the instrument—*quod fieri facias de bonis et catallis*—that you cause (satisfaction) to be made of the goods and chattels (of the defendant). It was issued to the sheriff for the purpose of enforcing a judgment for damages and costs. Originally, as the clause quoted above indicates, it was leviable only upon personal property. If a judgment creditor wished to levy upon real estate, he was obliged to take out a writ of elegit (q.v.). Both writs have in most jurisdictions been superseded by the modern writ of execution (q.v.).

FIERY BOLE'TUS. See FUNGI, EDIBLE AND POISONOUS.

FIESCHI, fê-ĕs'kê, GIUSEPPE MARIA (1790–1836). A Corsican, known through his attempt on the life of King Louis Philippe. At first a shepherd, he later entered the Neapolitan army under Murat, became a sergeant and a member of the Royal Bodyguard, and was given the cross of the Two Sicilies for bravery in the campaign of 1812–14. With shameless treachery he twice betrayed the cause of Murat to the Austrians. In 1816, having returned to Corsica, he was sent to prison for 10 years for forgery and served his time at Embrun. After leading the life of a vagabond for a year, Fieschi came to Paris at the time of the July revolution and was employed by the police in a minor capacity. The immediate cause of his plot was his dismissal by order of the prefect of the Seine. Disguising his purpose under the cloak of political enthusiasm, he leagued with himself one or two persons of Republican enthusiasm who hated the government of Louis Philippe. These were Morey, a saddler; Pepin, a grocer; and Victor Boireau, a maker of lamps. Fieschi sketched the plan of an infernal machine with 20 barrels that could be simultaneously discharged, had one made, and placed it in a house on the Boulevard du Temple. The review of the National Guard held there, July 28, 1835, afforded him the opportunity he desired. On the approach of the King and Queen he fired his machine. Eighteen people were killed, among whom was Marshal Mortier, who fell dead beside his sovereign. Louis Philippe, however, escaped with a mere scratch and was able to continue the review. The assassin was immediately seized and, with his accomplices, was tried, condemned, and executed Feb. 16, 1836. Consult: *Procès de Fieschi et de ses accomplices, devant la cour des Pairs* (Paris, 1836), containing a biography of Fieschi; Blanc, *Histoire de dix ans* (Paris, 1842; Eng. trans., London, 1844–45); Du Camp, *Les ancêtres de la Commune: l'attentat Fieschi* (Paris, 1877); Thornbury, *Old Stories* (London, 1870); G. Weill, *La France sous la monarchie de Juillet* (Paris, 1902); Thureau-Dangin, *Histoire de la monarchie de Juillet* (ib., 1887–90).

FIESCO, fê-ĕs'kô. A tragedy by Schiller (1783).

FIESCO, or **FIESCHI**, fê-ĕs'kê, GIOVANNI LUIGI, COUNT OF LAVAGNA (c.1523–47). The head of a conspiracy against Andrea Doria (q.v.). He was born about 1523 and was a member of one of the oldest and most illustrious houses of Genoa. In organizing and planning his famous plot he seems to have been actuated by motives both of patriotism and class feeling. He belonged to the French, or popular, party, while the Doria were aristocrats and imperialists. Andrea Doria, the famous admiral, sprung from a race hereditarily at feud with the Fieschi, having expelled the forces of Francis I from the state, had made himself practically dictator at Genoa, and held the office of doge, while his nephew, Gianettino, commanded the galleys. Count Fiesco organized a plot, having for its object the death of Doria and Gianettino, whom the admiral had designated as his successor in power, and the establishment of an oligarchic form of government. He speedily enrolled a formidable array of accomplices, his three brothers among the foremost, and entered into secret negotiations with France and Rome and the Duke of Parma. Doria, in spite of repeated warnings, refused to ascribe treacherous or subversive designs to Fiesco, whom he regarded as a friend and partisan, and an alliance by marriage was even arranged between the families. Complete success seemed at first to crown the conspirators. When the attack was finally made, Jan. 2, 1547, the gates of the city were forced, the fleet was captured, Gianettino was assassinated, and Doria put to flight. The Count had but to appear and dictate, but he was nowhere to be found. It was finally discovered that, in stepping from one galley to the other in the darkness of night, he had stumbled and, falling overboard, was borne down by his ponderous armor and drowned in the harbor. This put an end to the conspiracy, and the whole Fiesco faction was dissolved by his death. Doria returned in triumph, and those of the Fieschi who were not slain were banished forever from Genoa. This episode has been the subject of many poems and dramas. Fiesco's fame is due to Cardinal Retz and especially to J. J. Rousseau, who made a cult of him. Schiller founded a tragedy on this dramatic event. Consult: Mascardi, *Historical Relation of the Conspiracy of the Count of Fieschi*, trans. by Hare (Edinburgh, 1886); Retz, *La conjuration du comte de Fiesque* (Paris, 1884); Brea, *Sulla congiura de conte*

G. L. Fieschi (Genoa, 1863); Sismondi, *History of the Italian Republics* (Eng. trans., New York, 1870); Petit, *André Doria* (Paris, 1887); Calligari, *La congiura del Fiesco* (Venice, 1892); Gavazzo, *Nuovi documenti sulla congiura del conte Fiesco* (Genoa, 1886); Acinelli, *Compendio della storia di Genova* (ib., 1750).

FIESOLE, fyā'zô-lâ (Lat. *Fæsulæ*). One of the ancient Etruscan cities. It is situated on the crest of a hill, about 3 miles northeast of Florence. The heights of Fiesole (970 feet) command a remarkably beautiful view of Florence and the surrounding hills. In 225 B.C. Fiesole was the scene of a Roman defeat by the Gauls; here also Hannibal encamped after crossing the Apennines. The city was sacked by Sulla, who afterward dispatched thither a military colony, which was chosen by Catiline as his headquarters. During the Gothic rule in Italy, Fiesole was so strongly fortified and garrisoned as to endure a long siege by Belisarius. The growth of Florence during the Middle Ages gradually reduced it to insignificance. Pop. (commune), 1901, 17,176; 1911, 10,434. The only vestige of Etruscan structures still remaining is the cyclopean city wall, constructed of huge blocks of stone, many portions of which are wonderfully perfect. The site of the Etruscan fortress is now occupied by a convent, and interesting fragments of the foundations have been brought to light. To the Roman period belong the ancient theatre, small but well preserved, and some interesting ruins of baths. The church of St. Alexander contains 15 ancient columns and probably occupies the site of a Roman temple. The cathedral of San Romolo, begun in 1028 and restored in 1256, is an example of the simple early Romanesque style. Consult: Baedeker, *Northern Italy* (Leipzig, 1913); Dennis, *Cities and Cemeteries of Etruria* (2d ed., London, 1883); Nissen, *Italische Landeskunde*, vol. ii (Berlin, 1902).

FIESOLE, FRA GIOVANNI DA. See ANGELICO, FRA.

FIESOLE, MINO DA. See MINO DA FIESOLE.

FIÉVÉE, fyâ'vâ', JOSEPH (1767–1839). A French publicist and novelist, born in Paris. His *Sur la nécessité d'une religion* (1795), as well as many cutting epigrams, made him unpopular with the Directory, and he thought it prudent to withdraw to the country, where he spent his leisure in writing two clever novels, *La dot de Suzette* (1798) and *Frédéric* (1799). The advent of Napoleon to power brought Fiévée to Paris, where he became a loyal chronicler of the Consulate and the Empire. He left an interesting *Correspondance et relations avec Bonaparte* (4 vols., 1837).

FIFE (Fr. *fifre*, It. *piffero, pifara*, from OHG. *pfifa*, Ger. *Pfeiffe*, pipe, from ML. *pipa*, pipe, from Lat. *pipare*, to pipe, from onomatopoetic Gk. πιπάζειν, *pipazein*, to chirp). An ancient wind instrument with six holes. It differs from the piccolo in that it has no keys. Its compass is two octaves from d^1 to d^3. The fife is pitched in various keys, the most common being F and B♭, The fife figures in the sculptured memorials of the Argonautic expedition and from that time to this has maintained its place as a simple yet effective instrument for martial purposes.

FIFE. See FIFESHIRE.

FIFE, ALEXANDER WILLIAM GEORGE DUFF, first DUKE OF, and MARQUIS OF MACDUFF (1849–1912). A British peer. He was educated at Eton and succeeded his father as the sixth Earl of Fife in 1879. From 1874 to 1879 he sat in Parliament as a Liberal. From 1889 to 1898 he was vice president of the British South Africa Company. In 1889 he married Princess Louise Victoria Alexandra Dagmar, the eldest daughter of Edward VII, then Prince of Wales, and was created Duke of Fife. He was made Knight of the Garter at the coronation of George V, his brother-in-law. In December, 1911, with his wife and two daughters, he was shipwrecked in the *Delhi* on the coast of Morocco; and he died in Assuan, Egypt, six months afterward of pneumonia. He was an able business man and prominent in the Volunteer movement.

FIFENESS, fīf-nĕs'. A low headland, the easternmost point of Fifeshire, Scotland, lying on the north side of the Firth of Forth (Map: Scotland, F 3). To the north in the sea are the dangerous Carr rocks, with an iron beacon 35 feet high, which required six years to construct. Fifeness is in view of the Isle of May and Bell Rock lights. There still remain traces of a wall built by the Danes in the latter part of the ninth century.

FIFE RAIL. See BELAY.

FIFE'SHIRE. A maritime county of the eastern midland division of Scotland, between the Firth of Forth on the south and the Firth of Tay on the north (Map: Scotland, E 3). Area, 504 square miles; coast line, 108 miles, mostly rocky and having many small ports. The surface is a succession of cultivated vales and hills, agriculture being in an advanced state. The principal river, the Eden, flows for 25 miles generally northeast into the North Sea. There are many coal and iron mines and lime quarries. Fifeshire ranks next to Lanarkshire in its production of coal in Scotland. Linens of all grades, oil cloth, paper, and malt liquors constitute the leading manufactures. Pop., 1801, 93,743; 1851, 153,546; 1901, 218,840; 1911, 267,739. Capital, Cupar. See SCOTLAND, *History*.

FIFTH MONARCHY MEN. An English sect of millenarians which appeared during the Puritan Revolution. It expressed belief in the literal interpretation of Daniel's prophecy that the four great monarchies of Antichrist—Assyria, Persia, Greece, and Rome—were to be succeeded by a fifth monarchy—the reign of Christ on earth for 1000 years. They differed from other Second Adventists in considering it a duty to assist the establishment of the new kingdom by force. In the expectation that the Commonwealth was the commencement of the new era, they joined Cromwell's army in large numbers. The march of events was, however, not sufficiently swift to please them; and in 1657, on the discovery of a plot to murder the Protector and to revolutionize the government, their leaders, Venner, Grey, Hopkins, and others, were arrested and kept imprisoned until after Cromwell's death. After the Restoration on Jan. 6, 1661, Venner, who was a wine cooper, led 50 associates in an attempt to take possession of London in the name of King Jesus. Those who were not killed were taken prisoners, and Venner and 10 others were hanged for treason. Consult: Masson, *Life of Milton*, vol. iii (Cambridge, 1859–94); Gardiner, *Commonwealth and Protectorate* (London, 1894–1901); Neal, *Puritans* (Portsmouth, 1816–17); Carlyle, *Cromwell's Letters and Speeches* (London, 1845).

FIG (AS. *fic*, OFr. *figue, fige*, from Lat. *ficus*, fig). The fruit of various species of *Ficus*, but especially the edible fruit of *Ficus carica*, a diœcious plant, 15 to 30 feet high, with rough, deep-lobed leaves, belonging to the Moraceæ family. This plant, so far as known, is a native of Asia from Syria to Caucasus and Kurdistan. Like the date, it is an inhabitant of tropical and subtropical countries, and because it often bears three crops of edible fruit in a season, it was one of the chief reliances of the peoples inhabiting its native country previous to the time when cereal grains were introduced into general cultivation. Besides being edible in a fresh state, the fig can be canned, preserved, or dried, in which conditions it is sold as a commercial article. Its chief importance, however, is as a dried fruit, thousands of tons being annually consumed in the United States and England alone. Found wild in the earliest inhabited countries, the fig has accompanied man in all his wanderings wherever a suitable climate has permitted its introduction. It was common in Greece during the time of Plato, was early carried into Italy and thence to Spain and Gaul. It was introduced into England prior to 1257 and has since maintained a more or less precarious existence as a standard in the south of England to this day. It is most successful when trained on walls and given winter protection. In such situations it bears well and is remunerative where there is a suitable market for the fresh product. As a greenhouse plant, the fig is common everywhere outside the range of successful outdoor culture.

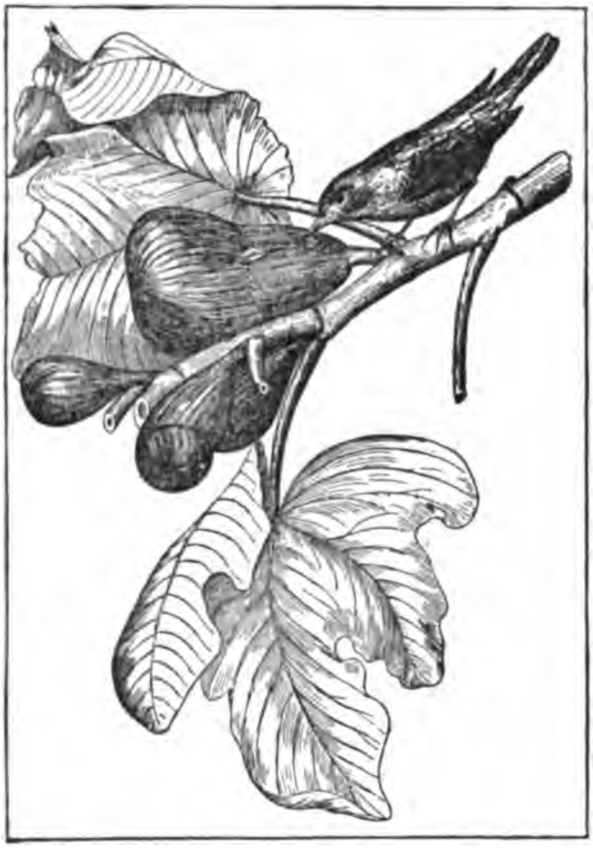


FIG AND FIGPECKER.

A typical Italian cultivated fig ("fetifero") and the fig-pecking bird, the "beccafico" (q.v.).

In the United States the fig has long been in cultivation in the Gulf States and even as far north as North Carolina, while in California it finds its most congenial conditions; it is here too that the closing years of the nineteenth century witnessed the successful establishment of caprification, as a result of which the production of Smyrna figs in California may be accepted as an established enterprise. Caprification is the name given to the operation commonly practiced by the natives of fig-growing countries. It consists in the tying of branches of the wild fig, or caprifig, in the tops of the cultivated trees. The caprifig, which is found wild in southern Europe, northern Africa, and western Asia, now cultivated in California, is the only fig bearing staminate flowers. It is therefore absolutely necessary that this variety be planted near cultivated sorts from which mature seeds are desired. Because of the peculiar structure of the fig fruit, the flowers being borne, as it were, on the inside of the receptacle, the process of pollination cannot be accomplished either by the wind or by ordinary insects. A peculiar hymenopterous insect, called Blastophaga, is an inhabitant of these wild figs in their native country and also visits the cultivated varieties; it is to them alone that the pollination of the cultivated sorts is due. Smyrna fig culture would be an impossibility without this insect. Until this fact was known all attempts at cultivating this fig outside of Smyrna were failures. Now, however, these figs can be quite as successfully grown in California as in the native country. A recent discovery of great importance to the industry is that the insect-bearing caprifigs may be carried through severe winters indoors if packed in boxes, the layers of figs alternating with layers of sand. As the Smyrna fig produces only pistillate flowers, without pollination, the fruits attain only partial development, no seeds are formed, and the delicate flavor which constitutes the chief value of the Smyrna fruits cannot be secured.

Besides the caprifig (*Ficus carica*, var. *sylvestris*) and the Smyrna fig (*Ficus carica*, var. *smyrnica*) there are numerous other sorts more or less commonly grown, which attain edible perfection without the aid of pollen of the caprifig and without developing seeds. These are roughly grouped under the name "common edible figs." Of this class, the Mission figs bear two crops annually, the early figs, or "brebas," and the late or "summer figs." This subclass includes almost all of the figs in California and in the Southern States. Another peculiar group known as the San Pedro figs, some of which are grown in California and in Florida and other Southern States, mature only one crop of fruit, the "brebas"; the second crop always falling before reaching maturity. This is explained by the fact that the first fruits contain so-called mule flowers, which can develop edible fruits, while the fruits of the second crop contain only pistillate flowers, like those of the true Smyrna fig, and, as there is no pollen to fertilize them, they fall. In the Adriatic figs, a third subclass, these conditions are reversed; hence the "brebas" fail to develop. The United States Department of Agriculture recently announced the successful employment of a fig from Abyssinia in caprifying this "brebas" crop.

The fig is easily propagated either by budding, grafting, cuttings, or layers. In general, however, cuttings serve the purpose best. They are best made from the ripened wood of the previous season's growth. As the fig is not a hardy plant, its cultivation as a standard is limited. On the Atlantic seaboard it is confined to States south of Virginia, and in the West to California, where the most extensive orchards of America exist. The tree is long-lived, comes into bearing early, and consequently requires a free space in which to ripen its fruit; it is therefore frequently planted as an avenue or border tree. In the orchard it should be given 40 feet each way; and if grown with other plants these must be removed before crowding occurs.

All the dried figs grown in America are produced in California; outside this region the copious rains have a detrimental effect upon the fruits, rendering them unfit for the purpose. The dried fig output of California is steadily increasing. In 1886 the total output was estimated at 100,000 pounds. It reached an annual average of 10,000,000 pounds for the three years ending with 1913. During the same period the United States imported from Smyrna an average of 20,000,000 pounds annually. In a fresh state for table use the fig can be transported only a short distance. In recent years the canned-fig industry has assumed commercial importance in the Gulf States.

For a discussion of varieties suited for these various purposes, consult: Bailey, *Standard Cyclopedia of Horticulture* (New York, 1914); Van Velzer, *Fig Culture* (Houston, Tex., 1909); "The Fig," *California Board of Horticulture* (Sacramento, 1890); "The Fig," *United States Department of Agriculture, Division Pomology, Bulletin 9* (Washington, 1901).

Fossil Fig. The fig and its allies are represented by numerous fossil remains, consisting almost entirely, however, of the leaves. The genus *Ficus* itself appears first in the Lower Cretaceous rocks, and it has been recognized in the Cretaceous deposits of Greenland, of Moravia, and in those of Kansas and Nebraska in the United States. Numerous species have been found in the Tertiary rocks, especially in the Eocene and Miocene deposits of Europe and North America. Few fossil remains of the genus *Ficus* have been found in the rocks of those regions where the fig now grows in its native condition. Consult Solms-Laubach, *Herkunft, Verbreitung, Domestication der gewöhnlichen Feigenbäume* (Göttingen, 1882).

FIG, Adam's. See Plantain.

FIG, Indian. See Prickly Pear.

FIGARO, fē'gȧ'rō'. 1. A famous dramatic character, central figure in Beaumarchais' comedies *Le barbier de Séville* and *Le mariage de Figaro*, a clever, witty, nonchalant rogue. Mozart made an opera of *The Marriage of Figaro;* Paisiello, and afterward Rossini, of *The Barber of Seville*. 2. In 1826 the name "Figaro" was chosen for a Parisian journal, since famous, that counted among its contributors George Sand, Jules Sandeau, Alphonse Karr, Jules Janin, and other literary celebrities. It suspended in 1833, to be revived in even greater brilliancy in 1854 by its great editor, Villemessant (q.v.), whose *Mémoires* (1867) are a most valuable contribution to the history of French journalism. See Mariage de Figaro; Nozze di Figaro.

FIGEAC, fē'zhȧk' (Lat. *Figiacum*). The capital of an arrondissement in the Department of Lot, France, in a wooded valley on the right bank of the Selle, 32 miles east-northeast of Cahors (Map: France, S., G 4). It is irregularly built. The churches of Saint-Sauveur and Notre Dame du Puy, dating from the twelfth and fourteenth centuries, the Hôtel de Balène of the fourteenth century, are interesting and important. There is a fine obelisk to the memory of J. J. Champollion-Figeac, the Egyptologist, who was a native of the town. A college, library, and museum comprise its public institutions. It manufactures cotton, wool, and woodenware and carries on a trade in wine and cattle. There are zinc mines near by. Pop. (commune), 1901, 5861; 1911, 5808. The town arose around a Benedictine monastery founded in 755. It was captured by the Huguenots in 1576, and was one of their strongholds.

FIGEAC, J. J. Champollion. See Champollion-Figeac.

FIG EATER. See June Beetle.

FIG FOR MO'MUS, A. A volume of poetical satires by Lodge (1595), dedicated to the Earl of Derby.

FIG'GIS, John Neville (1866–). An English clergyman and historian, born in Brighton. He was educated at Brighton College, at St. Catharine's College, Cambridge, and at Wells Theological College, held several curacies, was lecturer at St. Catharine's in 1895–1901 and chaplain of Pembroke College in 1898–1900, and was Hulsean lecturer at Cambridge University in 1908–09, Noble lecturer at Harvard in 1911, and Bishop Paddock lecturer at the New York General Theological Seminary in 1913. In 1909 he became a member of the Community of the Resurrection. He contributed to the *Cambridge Modern History;* edited with R. V. Lawrence Lord Acton's *Lectures on Modern History* (1906) and his *History of Freedom, Historical Essays and Studies* (1907), and *Lectures on the French Revolution* (1910); and wrote *The Theory of Divine Right of Kings* (1896; rev. ed., 1914), *Illustrations of English History, 1660–1715* (1902), *Christianity and History* (1904), *Political Thought from Gerson to Grotius* (1907), *The Gospel and Human Needs* (1909, Hulsean Lectures), *Religion and English Society* (1910), *Civilization at the Cross Roads* (1912, lectures at Harvard), *Antichrist* (1913), and *Churches in the Modern State* (1914).

FIGHTING FISH. A small climbing perch (*Ctenops pugnax*) of southeastern Asia, and particularly of Siam, where it is very commonly kept captive for the amusement of its owners by its pugnacity. Two of these creatures when brought together often rush immediately to combat, or one will attack its own image in a mirror. Fish fights are a favorite amusement of the Siamese; the license to exhibit them yields a considerable annual revenue; and an extraordinary amount of gambling takes place in connection with them. The fighting fish has the anal and dorsal fins prolonged into tapering points. When the fish is quiet, its colors are dull; but when it is excited, they glow with metallic splendor, and the projected gill membrane waves like a black frill around the throat.

FIGHTING JOE HOOKER. A nickname given to Gen. Joseph Hooker (q.v.).

FIGHTING PARSON, THE. A nickname given to W. G. Brownlow (q.v.).

FIGHTING PRELATE, THE. A name given to Henry Spenser, Bishop of Norwich, who fought against the insurgents in the rebellion of Wat Tyler and later led an army into Flanders.

FIGHTING TÉMÉRAIRE, tā'mā'rār', THE. See TÉMÉRAIRE.

FIGIACUM. See FIGEAC.

FIGIG, fē-gēg'. An oasis in the eastern part of the Moroccan Sahara, near the Algerian frontier, covering an area of about 6 square miles, well watered, and containing large groves of date palms (Map: Africa, D 1). It has about 13,000 inhabitants, dwelling among 10 fortified villages, the chief of which is Senaga. The inhabitants nominally recognize the sovereignty of Morocco, but are independent in their internal affairs. The chief industries are fruit raising, cloth weaving, and manufacture of clothing.

FIGLINE, fē-lyā'nā. A city of Florence, central Italy, 25 miles southeast of Florence, on the left bank of the Arno, in the valley of which near here have been found many fossil mastodons, hippopotami, tigers (Map: Italy, F 4). The town markets silk, wine, and oil, and manufactures straw goods and knives. Pop., 1901, 11,478; 1911, 12,035.

FIG SHELL. Any of various tropical gastropod shells, of the genera *Ficula*, *Pyrula*, etc., so called from their shape. One of the best known is *Pyrula ventricosa*, of Oriental waters, which has a very extensive foot, like its relatives the tun shells (q.v.), and the mantle large-lobed, reflexed upon the shell, and profusely spotted. The shell is pear-shaped, has a long siphon canal, and the surface is transversely ridged. Several other species belong to the genus, which goes back to the Chalk and Tertiary periods.

A FIG SHELL (PYRULA VENTRICOSA).

1, dorsal view of the shell and expanded muscular parts. 2, ventral view, showing the extended siphon, head, with two short tentacles, and the oblong creeping muscle or "foot."

FIGUEIRA, fē-gā'ē-rā, or FIGUEIRA DA FOZ DO MONDEGO. A seaport town in the District of Coimbra, Portugal, situated at the mouth of the Mondego River, about 25 miles west by south of Coimbra (Map: Portugal, A 2). It is connected by rail with Lisbon and Oporto. The harbor is small and obstructed by a bar, but the town has considerable trade in salt, wine, fruit, and oil. Figueira is much visited for its bathing. Pop., 1890, 5676; 1900, 7890.

FIGUERAS, fē-gā'rās. A town in the Province of Gerona, Spain, situated in the centre of the Ampurdán, 14 miles from the French frontier and 21 miles north-northeast of Gerona (Map: Spain, G 1). On a height (480 feet) near the town is the pentagonal citadel of San Fernando, one of the strongest fortresses of Spain and the key of the Pyrenees. It was constructed in the latter half of the eighteenth century and admits a garrison of 16,000 men. This fortress has been so frequently taken by the French as to give rise to the common saying that in time of peace it belongs to Spain, but in time of war to France, having been captured by the latter in 1794, 1808, 1811, and 1823. The fertile plain of Ampurdán produces oil, fruit, grain, and wine, and the town has manufactures of soap, leather, liquors, alcohol, etc. It contains a secondary college, a civil and military hospital, and an asylum for the aged. In the parish church here Philip V married Maria Louise of Savoy in 1711. The antiquity of Figueras has been proved by the discovery of a Latin inscription dating before the Christian era. Pop., 1900, 11,084; 1910, 11,778.

FIGUERAS Y MORACAS, ē mō-rä'käs, ESTANISLAO (1819–82). A Spanish statesman. He was born at Barcelona, studied law at Madrid, entered politics, and became active in the Republican ranks. He was elected to the Cortes from Barcelona in 1851 and became the principal spokesman of his party. He was exiled in 1867 for complicity in a plot against Narváez, but returned after a few months. After the revolution of 1868 and the expulsion of Queen Isabella, he joined with Castelar, Salmerón, and Pí y Margall in actively opposing the reëstablishment of the monarchy, and in 1870, when, in spite of their efforts, Amadeus of Savoy became King, Figueras continued to oppose him. Upon the abdication of the King in 1873 and the establishment of the Republic, Figueras was made President of the Provisional Council of Ministers, a position which he held until the Constituent Cortes established a new cabinet. Figueras remained in the Cortes, a strong supporter of the Republic, until the restoration of the monarchy, December, 1874, when he retired to private life.

FIGUEROA, fē'gā-rō'ā, FRANCISCO ACUÑA DE (1791–1862). An Uraguayan poet, born in Montevideo. He was educated at Buenos Aires in the College of San Carlos, where he early distinguished himself by his metrical compositions in Latin. His first great work was an historical diary in verse describing the great siege of Montevideo in 1812–14. His poetical works cover a wide range of subjects, are written with great perfection in many different metres, and are considered Spanish-American classics. Figueroa published his poems under the title *Mosáico poético* in 1857.

FIGUEROA, fē'gā-rō'ā, FRANCISCO DE, (EL DIVINO) (c.1540–1620). A Spanish lyric poet, a contemporary and fellow townsman of Cervantes, having been born at Alcalá de Henares. Little is known of him, beyond the fact that he served for a time in a Spanish regiment in Italy, that he studied at Rome and Bologna, that soon after his return to Alcalá he made an advantageous marriage, and having won the favor of Don Carlos of Aragon accompanied him to Flanders in 1579. Shortly before his death Figueroa gave orders that all his poems should be burned. Most of those that escaped were afterward collected and edited by Luis Tribaldos de Toledo, to whom we owe these scanty details of his life. The first edition appeared in Lisbon, 1625; and the second, considerably enlarged and preceded by a brief discourse on the poet's life, appeared in Lisbon, 1626. The poems include sonnets, canzoni, elegies, and an eclogue, *Tirsi*, the name by which the poet himself was introduced by Cervantes in his pastoral *Galatea*. Figueroa was a disciple of Boscán and Garcilaso, both of whom he surpassed in his mastery of blank verse. His best-known sonnet is that written upon the death of Garcilaso's son. He shared with Francisco de Aldana, Fernando de Herrera, and Miguel Sánchez the title of *El Divino*. A selection of six of his poems is given in the *Biblioteca de Autores Españoles*, vol. xliii. Fifteen previously inedited poems were published by R. Foulché-Delbosc in *Revue Hispanique*, vol. xxv, pp. 317–343 (Paris, 1911), with a complete bibliography. Consult also the facsimile reproduction of the *Obras* (1626 edition) made by Archer M. Huntington (New York, 1903).

FIGUEROLA Y BALLESTER, fē'gā-rō'lā ē bȧl'yĕs-târ', LAUREANO (1816–1903). A Spanish political economist, born at Calaf (Barcelona). He became professor of political economy in the University of Barcelona and subsequently of commercial law at Madrid. As Minister of Finance, from 1866 to 1870, he did much to improve the wretched condition of the Spanish treasury. Among other reforms that he proposed were a reduction in the number of bishoprics and clergy and the reduction of the standing army by one-half. Upon the accession of Amadeo I he retired to his professorship and continued teaching his doctrine of free trade. In 1872 he was again forced into politics by being elected President of the Senate. In 1885 he was elected counselor for the District of Latina in Madrid, and the Council appointed him Syndic. From 1898 until his death he was president of the Real Academia de Ciencias morales y políticas. He published the *Estadística de Barcelona* (1849–54).

FIGUIER, fē'gyā', GUILLAUME LOUIS (1819–94). A French chemist and scientific writer. He became professor of chemistry at Montpellier in 1846 and at Paris in 1853 and carried out some original investigations. Later he devoted his time chiefly to the popularization of science. He became scientific editor of *La Presse* and afterward of *La France*. His works and contributions to scientific journals include some 80 volumes, many of which were translated into English. Among these are: *Exposition et histoire des principales découvertes scientifiques modernes* (4 vols., 1851–53; 6th ed., 1862); *Histoire du merveilleux dans les temps modernes* (4 vols., 1859–62); *L'alchimie et les alchimistes* (3d ed., 1860); *Vies des savants illustres depuis l'antiquité jusqu'au XIXème siècle* (5 vols., 1865; 2d ed., 1872–75); *Les merveilles de la science* (4 vols., 1866–69; new ed., 1911); *Les merveilles de l'industrie* (4 vols., 1873–76); *Les nouvelles conquêtes de la science* (4 vols., 1883–85); *Les mystères de la science* (2 vols., 1887).

FIG'ULINE. A term sometimes given to vessels or objects, especially ornamental ones, made of potter's clay. Palissy's rustic figulines are well known.

FIGULUS, PUBLIUS NIGIDIUS. See NIGIDIUS FIGULUS, PUBLIUS.

FIG'URATE NUMBER. See NUMBER.

FIG'URE, or **FORM** (Lat. *figura*, from *fingere*, to fashion, to feign; connected with Gk. *θιγγάνειν*, *thinganein*, to touch, Skt. *dih*, to smear, Goth. *deigan*, to knead, OHG. *teic*, Ger. *Teig*, Icel. *deig*, AS. *dāh*, Eng. *dough*), PERCEPTION OF. The spatial attribute of extension (q.v.) is ascribed only to certain classes of sensations, the visual and tactual; spatial relations, on the contrary, are predicable of all sensations alike, since all are localizable. Form, or figure, as used in psychology, is defined (Kuelpe) as "the general term comprehending all the spatial characteristics that can be *attributively* predicated of an impression." The perception of the figure of an object may then be regarded as the perception of a sum of extensions, and the problems involved are limited in their application to those sense departments to which extent may be assigned.

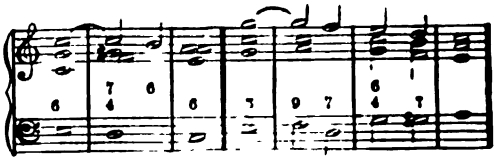
The cutaneous perception of figure has received but little investigation. Experiments made with certain stimulus forms—angles, open and filled circles, filled triangles—upon the tip of the tongue, the lips, and the tip of the middle finger, showed that the open circle is most easily cognized, and that the capacity of the surfaces for cognition of the forms is, in order of excellence, tip of tongue, tip of finger, lips. This dependency of the form limen upon the place stimulated is illustrated by the simple experiment of drawing a pair of dividers along the arm from the elbow to the finger tips, or from the lobe of the one ear to the lobe of the other, across the face. The objectively parallel lines seem to diverge towards the wrist, and as they pass the lips. The cutaneous limen for form is susceptible of marked decrease through practice.

The visual perception of figure may, like the perception of simple extension, be obtained by the resting eye in monocular vision, but for its full development binocular vision is essential. The visual perception of figure furthermore involves not only the perception of surface, but also the perception of depth, or the apprehension of extension in the third dimension. One problem of the perception of surface consists in reconciling the fact that the field of vision presents a continuous surface with the fact that the sensitive parts of the retina, the rods and cones, form a mosaic of discrete points separated by nonsensitive areas. (The diameter of a retinal cone is estimated at 0.0015–0.0044 millimeter, and the distance from the centre of one cone to the centres of adjacent cones at 0.0040 millimeter.) Explanations have been made in terms of binocular vision, of eye movement, and of our a priori bias towards continuity. See also BLIND SPOT.

Of special importance to the perception of the third dimension of figures are those optical phenomena known as the prevalence and rivalry of contours. When we observe the form of an object, the images which are cast upon the retinas of the two eyes differ slightly, owing to the difference in the position from which the two eyes view the object. If now these two images completely fused, the principal factor in the perception of depth would be removed; if, on the other hand, the two images remained obstinately disparate, it would be impossible to refer them to a single external object. It is the "prevalence" and "rivalry" of contours which "prevent the fusion of the two retinal images and secure to each a certain amount of independence" (Hering), although "the impressions of the two eyes always fuse to a single idea" (Wundt). The contour phenomena are easily demonstrable with the aid of the stereoscope. If, e.g., the right eye be stimulated by a uniform surface of white, and the left eye by a black letter A upon a white background, we have a striking instance of the prevalence of contour. The A is not made grayish, not washed over by the white of the right monocular field, but is seen in perfect clearness in the resultant single field; its contour suppresses or prevails over the surface presented by the white field. If each retinal field contains contours, and these contours possess little congruence, the phenomenon of "rivalry of contours" is observed. Thus, if the letter U were presented to the left eye and W to the right, or a vertical black band to the left eye and a horizontal black band to the right, there would be no fusion of the two images, nor would either image permanently prevail over the other; but there would be a rivalry and alternation of the two fields.

The visual perception of form plays an important part in the production of what are known as the "elementary æsthetic feelings." (See ÆSTHETICS, EXPERIMENTAL.) Finally, the perception of figure is extremely subject to illusion; small angles are overestimated, the height of a square is overestimated, etc. (See article ILLUSION.) And the study of illusory figures has, in turn, thrown a reflex light upon the psychology of the form perception. It has been found that the predisposition of the observer is important for the result: if the experimenter, e.g., prescribes a certain direction of attention, the perception may be modified. When, therefore, we speak of figure as a "sum" of extensions, we should add that this sum is to be taken in the integrative or psychological sense, and not in the sense of mere mechanical addition. (On the mechanism of this integration, see DETERMINING TENDENCY; PERCEPTION.) Consult: Titchener, *Experimental Psychology* (New York, 1901); Wundt, *Human and Animal Psychology* (Eng. trans., London, 1896); Kuelpe, *Outlines of Psychology* (ib., 1909); Witasek, *Grundlinien der Psychologie* (Leipzig, 1908).

FIGURED BASS, or THOROUGHBASS. A system of musical notation in which chords are denoted by placing figures over the bass note. It was first used in Italy during the latter part of the sixteenth century. The original object was to furnish the organist with a simple means of recognizing at a glance the necessary harmonic foundations in large choral or instrumental works. (The arrangement of the different parts in a score (q.v.) was not known then.) Playing from figured bass was a great art, because this system of notation indicates only the chord or its inversions, but nothing as to the leading of the various voices. To-day the art is not called for, as modern scores are written out in detail, and the figured bass in scores of the older masters (Bach, Handel) has been written out by eminent masters. (See FRANZ.) Figured bass plays an important part in the study of harmony, as all exercises are written in figured bass notation. Only the bass note is written. If no figure appears above the note, the ordinary triad is meant; the figure 6 denotes the first, $\begin{smallmatrix}6\\4\end{smallmatrix}$ the second inversion. The dominant seventh is expressed by 7; its inversions by $\begin{smallmatrix}6\\5\end{smallmatrix}$, $\begin{smallmatrix}4\\3\end{smallmatrix}$, 2 respectively. Suspensions are expressed by two figures—the first indicating the dissonance, the second its resolution. The interval of the third is not written out unless chromatically altered. Chromatic alterations are denoted by the usual signs placed before or after the figure 3♯, 5♭, 6♮. Sharps are also indicated by a line through the figure, $\not 6$. In figured bass all intervals are counted from the bass note, not the fundamental. For further information or complete exposition of the theory of figured bass, consult Richter, *Manual of Harmony* (trans. by Theodore Baker from the 25th German ed., New York, 1912). See ACCOMPANIMENT.



FIG'UREHEAD. A figure, or image, either a head, or bust, or full length—usually carved from wood, but in more recent vessels composed of hollow-cast bronze, carried at the prow or stem of ships. Its form is frequently dependent upon the name of the ship; the United States ship *Delaware* had the head of an Indian, supposedly of the Delaware tribe; the *Macedonian* had the bust of a Macedonian warrior, etc. The custom of placing figureheads on vessels of war is very ancient; the Phœnicians, Egyptians, Greeks, Romans, and Northmen all placed images of their deities or of other persons, or animals, or objects upon the prows of their war galleys. The change from sail to steam, the removal of the bowsprit and substitution of the straight stem, caused the old types of figurehead, scrollhead, billet-head, fiddle-head, etc., to disappear. For some years the ornamentation was placed on each side of the upper plating near or on the stem and consisted of scrollwork, the national coat of arms, etc., in gilt and colors. In some European navies and in passenger ships of the merchant service this practice still continues, but in the United States navy the figurehead and all other ornamentation have been entirely given up.

FIGURES OF A SYLLOGISM. Classes of the traditional categorical syllogism (q.v.) obtained by dividing syllogisms according to the relative positions of the major, middle, and minor terms. (See MAJOR.) Designating these terms respectively by the conventional symbols P, M, and S, we have these four classes of figures represented by the following formulæ, in which the four vertical columns to the right give the four figures respectively:

	I	II	III	IV
Major premise	M P	P M	M P	P M
Minor premise	S M	S M	M S	M S
Conclusion	S P	S P	S P	S P

See LOGIC.

FIGURES OF SPEECH. The general term under which are comprised all deviations in the use of words from the literal sense or from the literary or common forms and constructions. Such deviations have at different periods been variously classified and minutely differentiated. At the present time the tendency is towards greater generalization. The deviations from common use may be classified as figures of thought (figures of rhetoric) and grammatical figures (figures of etymology and figures of syntax). The individual figures are treated under Etymology, Figures of; Syntax, Figures of; and Rhetoric, Figures of. In addition to these classes older authorities recognized a fourth, figures of orthography, the subclasses of which were called mimesis and archaism—mimesis representing the imitation in spelling of illiterate or provincial speech, as in the modern dialect stories; and archaism, the reproduction of antiquated orthography and form. The figures of etymology, concerned entirely with the forms of words, are employed chiefly for their effect on rhythm and poetry. The omission of an initial letter (aphæresis), as *'gainst* for *against*, or of a letter within a word (syncope), as *ne'er* for *never*, or the separation of parts of a compound (tmesis), as *how* good *soever*, have almost no application to common speech or prose writing. The figures of syntax, or deviations in the construction, on the other hand, are in constant and unconscious use by speakers of all classes and ages. Their use adds directness, picturesqueness, and force to language. Of the figures of syntax, ellipsis is the most common and appears in exclamations, commands, and energetic utterances of many kinds. It consists in the omission of a word, phrase, or clause theoretically essential, the absence of which, however, heightens the effect of the words. Thus, *Here!* is more striking than *Come here. Bread* may be equivalent to *Give me some bread;* and in many business forms and in signs a word or two may have the value of a whole sentence, as *No smoking,* for *Smoking is not permitted.* Emphasis is gained by the figure called redundancy (the use of unnecessary words to express an idea); e.g., I did it *my own self.* The figures of rhetoric, or deviations from the usual application of words, add grace and beauty to the expression of thought and increase the resources of speech. Therefore they appear constantly in poetical composition and are frequent in prose and ordinary conversation. Simile requires a connective, pointing out the comparison: He is *as* brave *as* a lion; metaphor omits it: He *is* a lion. Such expressions as *roof* for *house* (synecdoche), or *gray hairs* for *old age* (metonymy), are figures in very common use founded on contiguity; and all the figures may be referred to the conscious or unconscious tendency towards enlarging the boundaries of language and heightening the emphasis of speech.

FIG'WORT FAMILY. See Scrophulariaceæ.

FIJI (fē'jē) or **VITI** (vē'tē) **ISLANDS.** A group of islands and a crown colony of Great Britain, in the southern Pacific, between lat. 15° 50′ and 20° S. and long. 176° 40′ E. and 178° W. (Map: Australasia, K 4). It is the largest and most valuable group in Polynesia. It consists of about 200 islands, of which about 80 are inhabited and among which the most important are Viti Levu (4250 square miles), Vanua Levu (2600), Taviuni (217), and Kandavu (150). The total area, including the island of Rotumah, lying north of the group and added thereto in 1880, is estimated at 7435 square miles. The larger islands are mountainous, with elevations of 4000 feet, and one of 5000 feet above sea level. The islands on the south and southwest side of the group are clothed with dense forests containing many valuable woods. The coasts are surrounded by coral reefs and form many good harbors. The islands are very fertile and well provided with rivers, of which the Rewa, the Ba, and the Singatoka, all on Viti Levu, are navigable in their lower courses through the coastal plain. In spite of their tropical situation the Fiji Islands have a comparatively cool climate. The temperature seldom rises above 90° F. or falls below 60° F. The rainfall is abundant, although unequally distributed. Severe hurricanes occur from time to time and cause immense damage to plantations, etc. These rotary storms or cyclones usually occur from December to April. Owing to their sanitary precautions, Europeans enjoy almost complete immunity from the diseases common to the Fijians and the Indian coolies. The flora of the islands is exceedingly rich. The principal native plants are yams, coconuts, bananas, and breadfruit. Sugar cane was introduced by European planters. The economic prosperity of the colony depends on three staple industries—the production of sugar, of copra, and of fruit, principally bananas and pineapples. The cultivation of corn and cotton, formerly important, has greatly declined. The sugar export increased from 32,961 tons (valued at £393,987) in 1900 to 72,834 tons (£797,274) in 1911; copra increased from 15,605 tons (£151,701) to 16,337 tons (£294,245); fruit increased from £28,112 to £151,667. There are also exports of Trochus shell, molasses, coconuts, cacao, bêche-de-mer, and bark. About 80 per cent of the trade is with Australia and New Zealand. There is no direct communication with the United Kingdom, but regular steam communication is maintained with Sydney, Auckland, Samoa, and Tonga. The total tonnage entered and cleared increased from 349,655 tons in 1902 to 613,343 tons in 1912. Total imports and exports, in 1902, £526,847 and £535,171; in 1912, £940,044 and £1,058,960. Suva, the capital, is connected by cable with Brisbane and Canada, and is an important aërograph station.

The colony is administered by a governor appointed by the crown. An executive council is composed of the governor and six official members. The legislative council consists of the governor and 10 official members, six elected members, and two native members. The colony is divided into 17 provinces, each under the control of a European commissioner or a chief native officer. A large share of self-government is conceded to the natives; their system of village and district councils has been recognized and improved, and is supplemented by an occasional meeting of the high chiefs and provincial representatives, presided over by the governor. An advisory board, consisting of the governor and British and native officials, formulates regulations in respect of native marriage and divorce, property succession, the powers and procedure of the native courts, and various other matters relating to the well-being of the native population. These regulations must receive the sanction of the legislative council before acquiring legal force. The seat of government was transferred from Levuka, in the island of Ovalau, to Suva, in Viti Levu, in 1882. The Dependency of Rotumah is administered by a European commissioner. In 1910 the revenue (of which over half is derived from customs) and expenditure of the colony were £211,952 and £236,661 respectively; in 1912, £238,947 and £268,158. Public debt (1911), £93,515.

The population of Fiji has been returned by the census as follows: 1891, 121,180 (of whom 105,800 Fijians); 1901, 120,124 (94,397); 1911, 139,541 (87,096). It is to be noted that, while there was a considerable increase in the total population during the last decade, the native race continued to decline. It was estimated in 1868 at 170,000; by the epidemic of measles in 1875 it was reduced by more than one-fourth. In 1911 males numbered 80,008, and females 59,533. The total was made up as follows: Fijians, 87,096; Indians, 40,286 (17,105 in 1901); Europeans, 3707; half-castes, 2401; Polynesians, 2758; Rotumans, 2176; Chinese, 305; others, 812. The Wesleyan mission reported 84,306 adherents at the end of 1911, and the Roman Catholic mission 10,592. Native education is provided chiefly by these missions, the Wesleyan schools numbering 1002 and the Roman Catholic 124. Suva, the capital, on a fine harbor on the south coast of Viti Levu, had a white population of 1376.

While somatically the Fijians are in basic association with the Melanesian race, there are recognizable traces of Polynesian admixture. At least two such mixtures are readily identifiable. One is superficial and somewhat narrowly confined to the eastern district, which the island geography denominates Lau. This mixture is quite modern, the result of intercourse with the neighboring Tongans which there is evidence to restrict to the last three centuries. The other mixture is a more general factor in the race and is of wider extent, for it is as plainly to be seen in the mountaineers of the great island as in the coast people. It is manifest in the bodily measurements, for the Fijians in stature and proportions more closely approximate the Polynesians than they resemble such Melanesians as are established as of pure stock; yet in the minor bodily characters, such as pigmentation, hair section, contour of the outer ear, and interstitial measurement of skin pores, the Fijians show wholly Melanesian character. The period of the great contact of the two races which has established this mixture is not yet definitely determined, but it lies at one of the two great historic events in the Polynesian settlement of the Pacific—the later being the incoming of the later, or Tongafiti, branch of the race, concerning which Samoan history establishes the last period in the expulsion of the Tongafiti in the onfall of Matamatame about 700 years ago. The earlier period of Fijian mixture lies at least 1000 years earlier. Present research into the problem will probably result in the establishment of the earlier date. The language betrays the double origin, the vocabulary having drawn very largely upon Polynesian, the grammar being of Melanesian complexity and precision. The Fijians have taken from the Polynesians the use of kava, have given to them (according to Samoan testimony) the art of tattooing, practice the Melanesian art of pottery with no little success, are cautious navigators, and excel in canoe building. In social condition they fell far below the Polynesians: for the power of the chiefs, while enormous in the individual, lacked the hereditary quality by which families become great. Cannibalism was practiced with great gastronomic delight and remained in the most frequent use down to the annexation to Great Britain, and even as late as 1892 appeared in a sporadic recrudescence of the ancient habit. In the savage state the Fijians were constantly engaged in wars, yet the casualty list was insignificant. The decline in their numbers began with the suppression of this exit for their animal spirits, with the interruption of their polygamy entailing a greater infant mortality, particularly with the introduction of alien diseases to a field in which protective immunization had not been acquired. The picture of the vital statistics is not yet a satisfactory one, but at each of the census periods there is observable a decrease in the rate of mortality which leads to the hope that the people will before long take the upward track.

Some of the islands of the Fiji group were discovered by Tasman in 1643 and visited by Cook in 1773, who discovered several others in the same group. The first accurate knowledge of the archipelago was obtained through the explorations of Dumont d'Urville in 1827 and of the American expedition under Wilkes and Hale (1840–42). Though fugitive convicts from Australia settled in Viti Levu as early as 1804, the European population grew very little, owing to the hostility of the natives, who were numerous, warlike, and addicted to cannibalism. Wesleyan missionaries reached the islands in 1835 and in 1854 succeeded in converting not only Thakombau, the most powerful of the native chiefs, but the mass of the people also. Complications with the United States led Thakombau to offer the sovereignty over the islands to Great Britain (1858). The proposal was declined. Between 1860 and 1869 immigration was rapid, 1800 settlers being there in the latter year. An attempt to establish a parliamentary government under Thakombau did not prove successful, and the offer to Great Britain was renewed and accepted (1874). In 1878, when sugar began to be extensively cultivated, the native Fijians began to deteriorate because of the competition of the coolies from India. In 1900 an attempt made by New Zealand to add the Fijis to herself failed because the Colonial Secretary would not sanction it. Consult: Agassiz, "The Islands and Coral Reefs of Fiji," in *Museum of Comparative Zoology Bulletin*, vol. xxxiii (Cambridge, 1899); Cumming, *At Home in Fiji* (London, 1887); Guppy, *Observations of a Naturalist in the Pacific* (ib., 1903); *The Australian Handbook* (Melbourne, 1913); *Quarterly Review*, vol. ccxvi, pp. 55–78 (London, 1912); Thompson, *Fiji: Past and Present* (Melbourne, 1899); Grimshaw, *Fiji and its Possibilities* (New York, 1907); Thomson, *The Fijians: A Study in the Decay of Custom* (London, 1908); Churchill, *The Polynesian Wanderings* (Washington, 1911).

FILAN'DER. See KANGAROO.

FILANGIERI, fē'lăn-jyā'rē, GAETANO (1752–88). An Italian jurist, author of a monumental treatise, *La scienza della legislazione*. Born in Naples, of a noble family, he was trained for a military career, which he soon abandoned for legal and scientific studies. When barely 20, he published his first work, *Public and Private Education*. Among his early successes as a lawyer was an able defense of a royal decree, which won him the appointment of court advocate and led to various other offices and honors from the King. The first three parts of his principal work appeared in 1780–83 and incurred the censure of the Catholic church. Ferdinand IV, however, rewarded the author with a pension and relieved him from all his court duties. The *Scienza della legislazione* (1780–88), which was to have consisted of seven books, but remains incomplete, was evidently written under the influence of Montesquieu, but shows the effects of Vico, Giannone, and Rousseau. It has the defect, characteristic of the century, of subordinating empirical research to deduction from philosophical principles and is somewhat colored by local problems of Neapolitan government; but this great work is still of use.

His son, CARLO (1784–1867), Prince of Satriano, was born in Naples. He entered the French army, was made a captain at Austerlitz, and fought in Spain with Murat. In 1849 he became Viceroy of Sicily under Ferdinand II, and he was made Minister of War by Francis II in 1859. He held this office for one year, when he fell from power, and did not again enter politics.

FILARETE, fē'lȧ-rā'tȧ, ANTONIO (called also ANTONIO AVERULINO) (c.1400–70). A Florentine sculptor of the Renaissance. He probably assisted Ghiberti on the doors of the baptistery at Florence and was engaged by Pope Eugene IV to execute the bronze doors for St. Peter's in Rome (1433–45), now used for the central entrance of the church. His work is an inferior imitation of Ghiberti's masterpiece, but the reliefs are clumsy, the figures lifeless, and the subjects represented are a strange mixture of Christian and pagan thought. The figure of St. Mark over the entrance of San Marco is also attributed to him, as well as the tomb of the Cardinal of Portugal (except the effigy) in the Lateran, but without sufficient proof. He was afterward banished from Rome and was invited to visit Milan by Francesco Sforza, for whom he began the Ospedale Maggiore, but lived to complete only the right wing. He was one of the many architects employed on the cathedral at Milan and constructed the cathedral at Bergamo. He wrote a curious and interesting treatise on architecture, *Trattato di architettura* (1460–64), in which he described an ideal city, called Sforzinda. This work remained in manuscript until 1890, when it was published in Vienna. Consult Von Oettingen, "Leben und Werke des Antonio Averulino," in *Beiträge zur Kunstgeschichte*, new series, vol. vi (Leipzig, 1888); and especially Lazzaroni, *Filarete, scultore et architetto del secolo XV* (Rome, 1908).

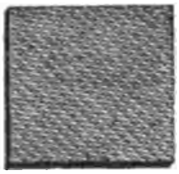
FILA'RIA (from Lat. *filum*, thread). A parasite found in the blood, lymph, and other fluids of the human body. It was first seen by Demarquay, in 1863, in a fluid obtained from a galactocele, and was identified in 1866 by Wucherer of Brazil. In 1868 Salisbury found the eggs in human urine. In 1872 T. R. Lewis found filariæ in the blood. *Filaria medinensis*, or Guinea worm, is found in different tissues of the bodies of negroes in Guinea, Senegal, Egypt, Arabia, Persia, and India. It is from 1 to 10 feet long and about $\frac{1}{10}$ of an inch wide, and causes painful tumors, blisters, or boils, and sometimes gangrene. *Filaria sanguinis hominis nocturna*, which is about $\frac{1}{75}$ of an inch long, is found in the blood. It is indigenous to Africa, India, China, Australia, and Brazil, and has been found in negroes in our Southern States. "Craw-Craw," a West African skin disease, has been found to be associated with filariasis. In *Filaria loa*, also a West African disease, the filariæ wander through the subcutaneous tissues, especially of the face and eyes, producing inflammation. At least half of the natives of Samoa are said to be affected with filariasis. The parasite is transmitted by mosquitoes, as has been demonstrated by Manson and by Low. In *Culex fastigans* filaria embryos mature rapidly, after the insect has fed on the blood of a patient suffering from filariasis, and the perfect filariæ are found in the head, neck, and proboscis of the mosquito. Strong, of the Chief Surgeon's Office, Division of the Philippines, has found filariasis in Iloilo. He believes that the disease will become domesticated in the Southern States, through the return of the American soldiers. This form of filaria is a white, opaline, hairlike worm, tapering towards the ends, which are blunt. It is found only after sundown, appearing in the blood about 6 P.M. A diurnal variety has been discovered by Manson in Congo negroes. The nocturnal variety is found by day in the blood of patients who work by night and sleep by day. Granville advances the theory that the appearance in the blood of this parasite is dependent upon certain conditions of the circulation and of the chyle during sleep. Filariasis is limited between the parallels of lat. 30° N. and 30° S., unless transported by some one infected within the tropical limits. It is found in Brazil, many of the West Indies, in Mexico, and the west coast of South America, the South Sea Islands, Japan, Australia, and China, besides the countries already named as comprising the habitat of the Guinea worm. Parental forms of filaria cause several endemic diseases, including elephantiasis arabum, lymph scrotum, lymph vulva, chyluria, hæmatochyluria, and ascites. Consult: Wucherer, in *Gazeta Medica da Bahia* (Brazil, December, 1868); Lewis, in *Medicinisches Centralblatt*, No. 43 (Vienna, 1877); Manson, *The Filaria Sanguinis Hominis* (London, 1883); and Tropical Diseases (New York, 1907); Daniels, *Tropical Medicine and Hygiene* (ib., 1913).

FIL'BERT. See HAZELNUT.

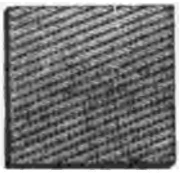
FILDES, fildz, SIR LUKE (1844–1927). An English genre and portrait painter and illustrator, born in Liverpool. He studied in the South Kensington schools and the Royal Academy, made many drawings for the *Cornhill Magazine*, the London *Graphic*, and other periodicals, and illustrated the last work of Charles Dickens—*Edwin Drood*—and of Lever. He exhibited his first oil picture in the Royal Academy in 1872—"Fair, Quiet, and Sweet Rest." Fildes painted a series of large pictures of the life of the English people, such as "Return of the Penitent," "The Widower," and "The Poor of London." He seems peculiarly successful in depicting the hard and sordid experience of the London suffering poor. Well equipped technically, he portrays these scenes and situations with a realism that strongly impresses the beholder and with a great deal of manly sympathy. His vividly colored Venetian street scenes, with their groups of idealized women, such as "Venetian Life," and "An al-fresco Toilette" (1889), are also well known. Later he painted chiefly portraits, including the coronation portraits of King Edward VII and Queen Alexandra and the state portrait of King George (1912). His painting "The Doctor" (1891) is in the Tate Gallery, London. He was elected to the Royal Academy in 1887 and knighted in 1906. Consult his biography by Thomson (London, 1895).

FILE (AS. *feol*, OHG. *fihala*, *fila*, Ger. *Feile*, OChurch Slav. *pila*, file; connected ultimately with Lat. *pingere*, to paint, OChurch Slav. *pisati*, to write, Skt. *piś*, to adorn). A steel instrument with sharp ridges or teeth made by the indentations of a chisel, which is employed for cutting down and shaping metals or other hard substances. Abrading instruments having the general characteristics of files are doubtless very ancient. Indeed, the file may be said to be represented in its earliest and crudest form by the rough stones used by prehistoric man in shaping his implements of war and of the chase. Artificially made files are mentioned in the Old Testament in 1 Sam. xiii. 21, and they are also mentioned in the *Odyssey*. These files were doubtless crude in form and very inefficient in operation compared with the modern tool of the same name; but the fact that they were mentioned in these early writings is proof of the consideration in which they were held by the metal workers of ancient times. The file has continued to be one of the most useful of hand tools for working metals and is to-day produced in enormous numbers and with an almost endless variety of forms and characteristics.

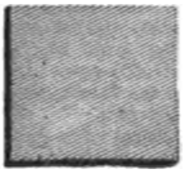
DOUBLE CUT SMOOTH.

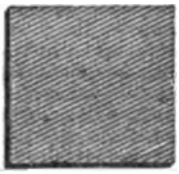

DOUBLE CUT 2D CUT.

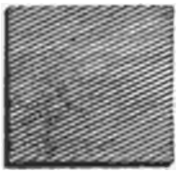
DOUBLE CUT BASTARD.

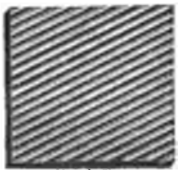

DOUBLE CUT COARSE.

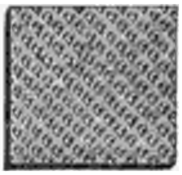
The modern file is a bar or rod of hardened steel having one end forged down to a long slim point or tang for insertion in a wooden handle, and the remainder of its length covered on one or all sides with serrations or teeth. A *rasp* is a species of file in which each tooth is an angular pit with a strong burr formed by a pointed punch, instead of a long furrow formed by a broad-bladed chisel. Files and rasps are distinguished first by their length, which is always measured exclusive of the tang, second by their shape, and third by their cut, which has reference not only to the character, but also to the relative degrees of coarseness of the teeth. The length of a file is the distance between its heel, or part of the file where the tang begins, and the point or end opposite. In general the length of files bears no fixed proportion either to their width or their thickness, even though they be of the same general shape or kind. By kind, in speaking of files, is meant the varied shapes or styles of files which are distinguished by certain technical names, as, e.g., flat, mill, and half-round. The various kinds of files are grouped according to the shape of their cross section into rectangular sections, circular sections, triangular sections, and miscellaneous sections. These sections are in turn subdivided, according to their general contour or outline, into taper and blunt. The term "taper" designates a file the point of which is more or less reduced in size, both in width and thickness, by


SINGLE CUT SMOOTH.


SINGLE CUT 2D CUT.


SINGLE CUT BASTARD.

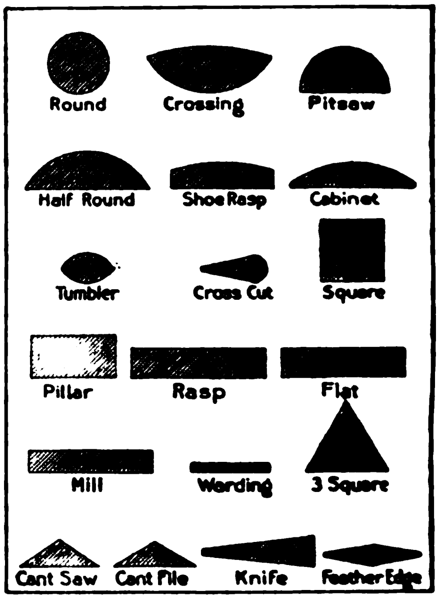

SINGLE CUT COARSE.


RASP SMOOTH.

RASP 2D CUT.

RASP BASTARD.

RASP COARSE.



CROSS SECTIONS OF TYPICAL FILES.

a gradually narrowing section extending from one-half to two-thirds the length of the file from the point. The term "blunt" designates a file that preserves its sectional shape throughout from point to tang. The cut of files is divided, with reference to the character of the teeth, into single cut, double cut, and rasp cut, and with reference to the coarseness of the teeth into rough, coarse, bastard, second cut, smooth, and dead smooth. The accompanying illustrations show all of these cuts. The rough-cut file is one in which a single unbroken course of chisel cuts is made across its surface, arranged parallel to each other, but oblique to the centre line or axis of the file. The double-cut file has two courses of chisel cuts crossing each other, the second course with rare exceptions being finer than the first. Rasp-cut differs from single or double cut in the respect that the teeth are disconnected from each other, each tooth being made by a single-pointed tool called a punch.

File teeth of any of the cuts described may be arranged so as to be spaced equidistant, or they may be arranged so that the spacing varies at different points of the file. When the latter arrangement is used, the files are designated as increment cut. The arrangement of the teeth in increment cut may be described as follows: 1. The rows of teeth are spaced progressively wider, from the point towards the middle of the file, by regular increments of spacing. 2. This general law of spacing is modified by introducing, as the teeth are cut, an element of controllable irregularity of spacing, which irregularity is confined within maximum and minimum limits, but is not a regular increment or decrement. 3. The teeth are so arranged that the successive rows shall not be exactly parallel, but cut slightly angularly with respect to each other, the angle or inclination being reversed during the operation of cutting as necessity requires.

The usual different sectional shapes of commercial files are shown in the accompanying illustration. In length such files range from 3 inches to 20 inches. Smaller files for jewelers, die sinkers, and watchmakers, and needle files are made of special material and in various special sizes. As indicating the small sizes in which files are produced, it may be noted that the smallest size of Nicholson round broach file is but 0.033 of an inch in diameter, and about 1 inch long.

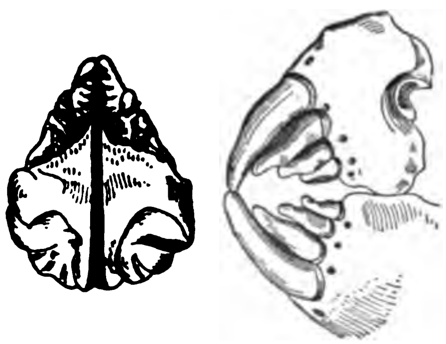
Manufacture. Formerly, all files were hand-made, the steel bar being forged to shape, ground smooth, and cut by hand tools. Most files are now made by machinery designed to perform all of these essential operations. The old method of hand cutting has a peculiar interest because of the deftness and skill required of the workman, and it will be described briefly for this reason, and also because it will help to explain the nature of the work required of modern file-cutting machinery. The following description is taken from Holtzapffel's *Turning and Mechanical Manipulation:*

"The first cut is made at the point of the file; the chisel is held in the hand at a horizontal angle of about 55° with the central line of the file, . . . and with a vertical inclination of about 12° to 14° from the perpendicular. . . . The blow of the hammer upon the chisel causes the latter to indent and slightly to drive forward the steel, thereby throwing up a trifling ridge or bur; the chisel is immediately replaced on the blank and slid from the operator, until it encounters the ridge previously thrown up, which arrests the chisel or prevents it from slipping farther back and thereby determines the succeeding position of the chisel. The heavier the blow, the greater the ridge, and the greater the distance from the preceding cut at which the chisel is arrested. The chisel, having been placed in its second position, is again struck with the hammer, which is made to give the blows as nearly as possible of uniform strength; and the process is repeated with considerable rapidity and regularity, 60 to 80 cuts being made in one minute, until the entire length of the file has been cut with inclined, parallel, and equidistant ridges, which are collectively denominated the first course. So far as this one face is concerned, the file, if intended to be single cut, would be then ready for hardening. Most files, however, are double cut; that is, they have two series or courses of chisel cuts. In cutting the second course, the chisel is inclined vertically as before, at about 12°, but its edge only a few degrees from the transverse line of the file, or about 5° to 10° from the rectangle. The blows are now given a little less strongly, so as barely to penetrate to the bottom of the first cuts, and from the blows being lighter they throw up smaller burs, consequently the second course of cuts is somewhat finer than the first. The two series, or courses, fill the surface of the file with teeth, which are inclined towards the point of the file."

At first sight it would appear from the simplicity and continual repetition of the movements required in file cutting that it was an operation especially adapted to be performed by machinery. Nevertheless, it was not until many years after the first inventor of a file-cutting machine had patented his device that file-cutting machines were successfully used, and that machine-cut files could compete with the hand-made product in the market. Among the notable inventors of file-cutting machines may be mentioned Duvesger (1699), Fardonet (1725), Thiout (1740), Brachal and Gamin (1765–78), Raoul (1800), Ericsson (1836), Robinson (1843), and Winton (1847). None of these machines was commercially successful. In 1865, however, Mr. W. T. Nicholson, of Providence, R. I., invented a file-cutting machine, which, as improved and modified from time to time, is now extensively used in the United States. About the same time M. Bernot, a Frenchman, devised a machine which proved commercially successful. Briefly described, the successful forms of file-cutting machines consist of a moving table on which the file blank is fixed, and which moves it progressively under a sort of trip-hammer arrangement carrying cutting chisels. In making machine-made files the bars of steel are first forged by hand or by machines and then ground smooth. The smoothed blank is then run through the cutting machine. The final process is to temper and harden the cut file.

Filing. To the uninitiated this may seem a simple operation of rubbing one piece of metal upon another, requiring only muscular strength and no skill. This is far from being the case, for a skillful workman will in a given time, with a given amount of muscular work, cut away a far greater quantity of metal with a file than one who is unskillful, for he makes every tooth *cut into* the work, instead of *rubbing over* it. To do this, he must adapt the pressure and velocity of motion of the file to the coarseness of its teeth and the hardness, brittleness, and toughness of the material he is working upon. To *file flat*—i.e., to avoid rounding the sharp edges of a narrow piece of work—is very difficult, and some years of continual practice is required before an apprentice can do this well, especially in "smoothing up" or finishing work before polishing, and there are some who never succeed in filing, smoothing, and polishing without rounding the edges of fine work. The power to do this constitutes the main test of skill among mathematical-instrument makers and other metal workers. The flattest surface can be obtained by laying the work, where its form admits, upon a piece of cork held in the vise, and filing it with *one hand;* the pressure on the file being communicated by the forefinger. It is mainly to aid the workman in filing flat that the rounded or bellied form is given to files; this partially compensates the tendency of the hands to move in a curved line with its convexity upward when they move forward, and apply pressure, as in the act of filing. In *draw filing* the file is held in the fingers of both hands and moved so that the ridges of the teeth are nearly parallel to the direction of motion. This makes a long shearing cut along the surface filed, and no tooth marks are left.

FILE'FISH. One of a family (Monacanthidæ) of small tropical and semitropical fishes closely related to the plectognath trigger fishes (q.v.). The scales are very small and rough, giving the skin a velvety appearance and making it serviceable as a polishing material. The name refers to the filelike appearance of the stout dorsal spine, which is rough and armed behind with two rows of barbs. The type genus *Monacanthus* contains several species, but the best-known filefish is the "barnacle eater" (*Alutera schœpfi*), which ranges northward to New England, may be 18 inches long, and has a "bright skin sometimes of an orange and sometimes of a tawny hue." It is a favorite object in aquariums. The habits of the group are much the same as those of the trigger fishes (q.v.). See Plate of PLECTOGNATH FISHES.



DENTITION OF FILEFISH.

Palatal and profile view of the teeth.

FILELFO, fē-lĕl'fō (Lat. *philelphus*), FRANCESCO (1398–1481). An Italian humanist, born at Tolentino. He studied at Padua, and in 1417 was called to teach moral philosophy and eloquence at Venice. There he became distinguished as an expositor of the works of Vergil and Cicero, which then constituted the principal textbooks in his subjects. In 1419 he was appointed secretary to the Venetian Consul at Constantinople, where he acquired an excellent knowledge of the Greek language and a valuable collection of Greek manuscripts. From 1427 he taught Latin and Greek at Bologna, Florence, and Siena, and from 1440 at Milan, where he was also attached to the court of the Duke, Filippo Visconti, as poet and orator. He wrote for the next Duke, Francesco Sforza, 12,800 lines of an epic known as the *Sforziad.* In 1475 he went to Rome, and in 1481 accepted the chair of Greek at Florence. He was neither a profound nor an accurate scholar, and his arrogance made him personally unpopular, but his energy did much to further the spirit of learning inspired by Petrarch. Consult Rosmini, *Vita di Filelfo* (Milan, 1808), and Symonds, *The Renaissance in Italy* (London, 1877).

FILE SHELL. A pholad. See PHOLAS.

FILIA'TION (from Lat. *filius*, son). In English and American law, a proceeding instituted for the judicial determination of the paternity of a person. It may be employed for the purpose of establishing legitimacy with reference to inheritance, or to determine the paternity of a bastard, in order to charge upon the father the support of his illegitimate offspring. In the United States the term is more commonly employed in the latter sense, as in the expression "filiation proceedings," for bastardy proceedings. See BASTARD; LEGITIMACY; PARENT AND CHILD.

FIL'IBUS'TERS (Sp. *filibustero*, from Fr. *flibustier*, *fribustier*, from Dutch *vrijbueter*, *vrijbuiter*, freebooter, from *vrij*, free + *buiter*, from *boete*, Eng. *boot*, profit). The name once applied to a class of piratical adventurers in the West Indies during the seventeenth century (see BUCCANEERS), but now generally used to designate any group or association of men who in disregard of international law forcibly intervene as private individuals in the affairs of any foreign state with which their own government is at the time on terms of peace. In American history the term is applied specifically to those citizens of the United States, or residents therein, who at various times in the nineteenth century intervened in the affairs of the West Indies or of Central or South America for the purpose of freeing colonies from Spanish domination or independent states from misgovernment, frequently with an underlying motive of securing the annexation of additional territory to the United States, and in many cases of extending the area of slavery and thus augmenting the influence of the "slave power" in governmental affairs. Aaron Burr planned to lead a great filibustering expedition into Mexico and Central America in 1806–07, and the independence of Texas, in 1836, was brought about in part by filibusters from the United States; but the most famous expeditions in American history were those of Lopez and Walker. Lopez, after making several fruitless attempts in 1850–51 to effect the liberation of Cuba, was finally, on Aug. 16, 1851, defeated, captured, and executed. Walker succeeded (1855) in overturning the government of Nicaragua, but quarreled with the native leaders and in 1857 was brought back to the United States by an American naval officer, to whom he had surrendered. He subsequently (1857–60) organized three more expeditions, each of which failed, and in September, 1860, was routed by the President of Honduras and summarily executed. (See LOPEZ, NARCISO; WALKER, WILLIAM.)

Minor expeditions were sent from the United States to Cuba during the years 1868–98, but they accomplished little and attracted relatively little attention, though much excitement was caused in 1873 by the brutal execution at Santiago, Cuba, of a number of Americans, mostly filibusters, found by the Spanish authorities aboard the captured steamer *Virginius*. Consult Roche, *Byways of War: The Story of the Filibusters* (Boston, 1901). See VIRGINIUS MASSACRE, THE.

FILICAJA, fē'lē-kä'yȧ, VINCENZIO DA (1642–1707). An Italian lyric poet, born in Florence. He was a member of the Arcadia and Crusca academies and was patronized by Christine of Sweden, who educated his children, and by the Grand Duke of Florence, who made him senator and later Governor at Volterra and Pisa. Of his numerous poems (*Poesie Toscane*, Florence, 1707) the most famous are those on the Turkish wars (1683) and the sonnets to Italy. The conflicting estimates of his work are explained by the fact that he had great emotions and a vivid imagination which he obscured under the exaggerated artificiality of the academic style of his time, of which he remains one of the most brilliant cultivators. Consult Amico, *Poesie e lettere di Vicenzio Filicaja* (Florence, 1864), and G. Caponi, *Vincenzio da Filicaja e le sue opere* (Prato, 1901).

FILICALES, fĭl'ĭ-kā'lēz. See FERN.

FIL'IGREE (formerly *filigrainc*, *filigrane*, Fr. *filigrana*, from Lat. *filum*, thread + *granum*, grain; the old filigree work being a combination of these two elements). The name applied to delicate wirework ornaments, usually of gold or silver wire, twisted and plaited into spirals and other convoluted forms, combined to form a sort of metallic lacework, and joined at their points of contact by gold or silver solder and borax, by the help of the blowpipe. Small grains or beads of the same metals are often set in the eyes of volutes on the junctions, or at the intervals, at which they will effectively set off the wirework; in early Greek work the gold ground was covered with infinitesimal gold grains. The more delicate tracery is usually set in a framework of stouter wire. It is used for brooches, earrings, crosses, head ornaments, jewel caskets, and like objects of a light and elegant character. This work is now chiefly done in Malta, India, Genoa, some Tuscan villages, the Ionian Islands, and some parts of Turkey.

The technique of filigree was not unknown to Egyptian jewelers, but it was perfected by Greek art, to which belong the examples found in Italian tombs, wrongly called Etruscan. The Greek filigree work of the golden age of the fifth and fourth centuries B.C. is of extraordinary beauty. The delicate frosting of the solid surface, produced by the sprinkling of fine gold grains, which is an essential part of perfect filigree work, appeared to be a lost process after the decline of Greek art, but was revived by the famous Roman collector, Castellani, who executed many beautiful copies. The firm of Tiffany has more recently carried its excellence still further. Necklaces, tiaras, hairpins, safety pins, earrings, rings, bracelets, are the principal classes of personal jewelry in the original Greek works. The Vatican, Louvre, and Metropolitan museums have the greatest quantity of works found in Italian tombs, while the British Museum has a large number discovered in Greek lands. The latest Greco-barbaric forms are best shown in specimens from southern Russia, at St. Petersburg and Kertch.

From the Roman period to modern times that part of the technique was most popular which consisted of the use of wirework. But the secret of frosting with gold grains was not lost, only the fashions had changed. In many collections of early mediæval jewel work there are reliquaries, covers for the Gospels, etc., made either in Constantinople from the sixth to the twelfth century or in monasteries in Europe, in which Byzantine goldsmiths' work was studied and imitated. These objects—though not entirely in filigree work—besides being enriched with polished but uncut precious stones and with enamel, are often decorated with filigree, soldered on to large surfaces of gold; and corner pieces of book covers or the panels of reliquaries are not infrequently made up of complicated pieces of plaited work, alternating with spaces incrusted with enamel. Byzantine filigree work occasionally has small stones set among the curves or knots. In the north of Europe the Goths, Saxons, Britons, and Celts were from an early period skillful in several kinds of goldsmiths' work. Brooches, and other personal ornaments in England, were incrusted with enamel work varied with borders or centres of filigree. The Irish filigree work is especially varied in design and reached its highest perfection in the tenth and eleventh centuries. The Royal Irish Academy in Dublin contains a number of such reliquaries and personal jewels, of which filigree is the general and most remarkable ornament, varied by numerous designs, in which one thread can be traced through curious knots and complications, which, disposed over large surface, balance one another, but always with special varieties and arrangements difficult to trace with the eye. The long threads appear and disappear without breach of continuity, the two ends generally worked into the head and tail of a serpent or a monster. The reliquary containing the "bell of St. Patrick" is covered with knotted work in many varieties. A two-handled chalice, called the 'Ardagh cup,' has belts, bosses at the junctions of the handles, and the whole lining of the foot ornamented with work of this kind of extraordinary fineness. Much of the later mediæval jewel work all over Europe down to the fifteenth century, on reliquaries, crosses, crosiers, and other ecclesiastical goldsmiths' work, is set off with bosses and borders of filigree. Mohammedan damascene work must be carefully distinguished, but filigree work in silver was practiced by the Moors of Spain during the Middle Ages with great skill and was introduced by them and established all over the peninsula, where silver filigree jewelry of delicate and artistic design is still made in considerable quantities. The manufacture spread over the Balearic Islands and among the populations that border the Mediterranean and continues all over Italy and in Albania, the Ionian Islands, and many other parts of Greece. That of the Greeks is sometimes on a large scale, with several thicknesses of wire alternating with larger and smaller bosses and beads, sometimes set with turquoises, etc., and mounted on convex plates, making rich ornamental headpieces, belts, and breast ornaments. Filigree silver buttons of wirework and small bosses are worn by the peasants in most of the countries that produce this kind of jewelry. Silver filigree brooches and buttons are made also in Denmark, Norway, and

Sweden. Little chains and pendants are added to much of this northern work. Beautiful specimens have been contributed to the various international exhibitions. Considerable filigree work in silver is produced by Armenian jewelers in Constantinople and Asiatic Turkey. Some very curious filigree was brought from Abyssinia after the capture of Magdala in 1870—arm guards, slippers, cups, etc. They are made of thin plates of silver, over which the wirework is soldered. The filigree is subdivided by narrow borders of simple pattern, and the intervening spaces are made up of many patterns, some with grains set at intervals. The Indian workmen retain many Greek patterns, and work them in the same way, down to the present day. Wandering workmen are given so much gold, coined or rough, which is weighed, heated in a pan of charcoal, beaten into wire, and then worked in the courtyard or veranda of the employer's house, according to the designs of the artist. The completed work is weighed on its restoration and the workman is paid at a specified rate for his labor. Very fine grains of gold are still used. This work requires the utmost delicacy of hand and is of extraordinary richness of effect. Great interest has been felt in the revival of the designs of antique jewelry by Signor Castellani. He collected examples of the peasant jewelry still made in many provinces of Italy on extraordinary designs preserved from a remote antiquity. Most of the decoration is in filigree of many varieties. It was in part through the help of workmen in remote villages, who retained the use of various kinds of solder, long forgotten elsewhere, that the fine reproductions of antique gold filigree have been so beautifully executed in Italy and by Italian jewelers. Consult the authorities referred to under JEWELRY.

FILINTO, fē-lēn′tō, ELYSIO. See NASCIMENTO, MANOEL DE.

FIL′IO′QUE. A Latin phrase meaning "and from the Son," which was added to the Nicene Creed by the Western church and has formed a prolific source of controversy between the Greek and Roman Catholic churches. According to the received Greek text, this article of the creed runs thus: "And we believe in the Holy Ghost, . . . who proceedeth from the Father." This was the form common to all sections of the Church in the fifth century. At the Third Synod of Toledo (589 A.D.), the Spanish bishops used a Latin version which contained the *filioque* addition, thus: "I believe in the Holy Ghost, . . . who proceedeth from the Father *and the Son*." This addition met with favor in the Western church, especially in Spain, after the conversion of the Goths, but was very offensive to the East. Passages could be cited from the writings of Augustine and Leo the Great in support of the doctrine of the "double procession," as it is technically called, but its formulation as part of the creed was destitute of ecclesiastical authority. The early ecumenical councils had omitted any expression of the double procession, and the symbol which expressed this faith had been pronounced unalterable. Nevertheless the Western church contended, first, for the truth of the doctrine implied in the *filioque*, and, later, for the symbolic authority of the clause itself.

The Synod of Gentilly (767) approved the clause, and in 809 Charlemagne convened a synod at Aix-la-Chapelle to examine the whole question of the proper wording of this clause. The decision was in favor of the form sanctioned at Toledo; but, the case coming before Pope Leo III, he discreetly refrained from giving his approval to the change in the creed, though he admitted the truth contained in the doctrine as a proposition of theology. The earliest formal recognition of the *filioque* by a pope was in 1014, when Benedict VIII permitted its use at the coronation of Henry II. By the middle of the eleventh century it had become well established in Rome. Meanwhile the break between the Eastern and the Western church had come. Photius, Patriarch of Constantinople, had charged Rome with violating the canons by allowing a change to be made in the creed, and this, together with other causes which need not be specified here (see GREEK CHURCH), brought about the great schism. Frequent efforts have since been made to heal this breach, but without success. Even the most hopeful attempts of Greek and Roman Catholics to reach some agreement on the *filioque* question, e.g., at the councils of Lyons (1274), and especially of Ferrara-Florence (1438-39), have accomplished no permanent result. That the Eastern church has persistently refused to admit the validity of the Roman contention may be seen from such official pronouncements as the *Orthodox Confession of the Eastern Church* (1643) and the *Larger Catechism of the Orthodox Eastern* (Russian) *Church* (1839). The great Greek theologian and doctor, John of Damascus, went to the limits of Eastern orthodoxy when he said, "The Holy Ghost proceeds from the Father through the Son." It is worthy of note that these words formed the basis of doctrinal agreement on this creed article reached at a conference of Old Catholic, Greek, and Anglican divines in Bonn in 1875, but no practical result followed their deliberations. Consult: E. S. Ffoulkes, *Historical Account of the Addition of the Word Filioque to the Creed* (London, 1867); Hefele, *History of the Councils*, vol. iii (Eng. trans., ib., 1883); Schaff, *Creeds of Christendom*, vol. ii (New York, 1890); Harnack, *History of Dogma*, vol. v (Boston, 1899).

FILIPINO, fil′ĭ-pē′nō. See PHILIPPINES.

FILIPPI, fē-lēp′pē, FILIPPO DE (1814-67). An Italian traveler and naturalist. He was born at Milan and, after holding professorships in zoölogy at Pavia and Turin, made a tour to Persia in 1862, which is described in his *Note di un viaggio in Persia* (1865). He was director of the zoölogical exploring expedition sent out in the *Magenta* to circumnavigate the globe, but died on reaching Hongkong. He was the author of the important work entitled *Delle funzioni riproduttive negli animali* (2d ed., 1856) and various books on travel.

FILIPPI, fē-lēp′pē, FILIPPO DE (1869-). An Italian physician, alpinist, explorer, and historiographer. He was born in Turin in April, 1869. As a member of the Italian Alpine Club he had made numerous ascents in the Alps, when (in 1897) he was invited to join the Duke of the Abruzzi's expedition to Alaska, which accomplished the first ascent of Mount St. Elias. The history of the expedition he later prepared. In 1906 he accompanied the Duke to Africa in his exploration of Ruwenzori (probably "Mountains of the Moon" of Ptolemy) and in 1911 went to Kashmir to attempt the ascent of "K2" (Godwin Austen). The elaborate volumes narrating these expeditions, as also the story of the Arctic voyage of the *Stella Polare*, on which the farthest north of the period was attained by the Abruzzi expedition, were also prepared by him. In 1913 he organized an expedition for a geological and physical study of an unvisited portion of the Karakoram Himalayas (Kashmir), in which he was engaged during the next year.

FILITE. See EXPLOSIVES.

FILIX-MAS. See FERN, MALE.

FILLAN, fĭl'*a*n, or **FAELAN,** SAINT. Two Irish or Scottish saints, whose histories are more or less legendary. 1. ST. FILLAN, or Faolan, the leper, was commemorated by a church in Scotland at the east end of Loch Erne in Perthshire, where "St. Fillan's well" was long believed to have supernatural power of healing. He also had a church in Ireland at Ballyheyland (anciently called Killhelan, or Kill Faelain), in the barony of Cullenagh, Queen's County. His day was June 20. 2. ST. FILLAN, the abbot, lived in the eighth century. He was a native of Ireland, became a monk there, and went to Scotland, where he seems to have lived at Strathfillan in Perthshire. His chief church was there, and also a well-endowed priory dedicated to him. His day is January 9. The silver head of his crosier, or pastoral staff—called the "coygerach" or "quigrich"—appears in record as early as 1428 and, after a curious history, is now preserved in the museum of the Society of Antiquaries of Scotland at Edinburgh. A hand bell which bore his name and was believed to work miracles is also in the same museum. Consult: Wilson, *The Quigrich or Crosier of Saint Fillan* (Toronto, 1859); also "Historical Notices of Saint Fillan's Crosier," by Dr. Stuart, reprinted from the *Proceedings of the Society of Antiquaries of Scotland*, vol. xii (1878); Forbes, *Kalendars of Scottish Saints* (Edinburgh, 1872).

FILLE DU RÉGIMENT, dụ rȧ'zhā'mäɴ', LA (Fr., The Daughter of the Regiment). An opera by Donizetti (q.v.), first produced in Paris, Feb. 11, 1840, in the United States in 1843 (New York).

FIL'LET (OF. *fillet*, ML. *filettum*, small thread, dim. of Lat. *filum*, thread). In architecture, a narrow flat surface or square edge in the profiles of moldings. In heraldry (q.v.), a charge. In Greek and Roman religious rites, a white and red band of woolen stuff, worn upon the forehead, as a sign of religious consecration and of inviolability. It was used by the priests and hence is spoken of usually as a sacred fillet. It appears in carved ornament in the fluttering ribbons associated with festoons (see FESTOON), both in antique and Renaissance art.

FIL'LEY, CHAUNCEY IVES (1829–). An American merchant and politician, born in Lansingburg, N. Y. He became the largest importer and distributor of queensware in the Mississippi valley. He was mayor of St. Louis in 1863–65 and in 1865 a member of the State Constitutional Convention which abolished slavery in Missouri. He was a member of the Republican National Convention in 1864 and thereafter of every State and national convention up to and including 1896, and also served as a member of the Republican National Committee from 1876 to 1892. He was postmaster of St. Louis in 1873–78 and president of the St. Louis Board of Trade in 1876–79. He published *Some Republican History of Missouri, 1856–1898* (1898).

FILLMORE, MILLARD (1800–74). The thirteenth President of the United States. He was born in Cayuga Co., N. Y., Feb. 7, 1800. After a youth of industry with little opportunity for education, he undertook the study of law, and was admitted to the bar in 1823. His practice of his profession, chiefly at Buffalo, continued actively for 24 years. His political life began in 1828 with his election as an Antimason (see ANTIMASON) to the State Legislature, where he served for three terms. In 1832 he was elected to Congress as a Whig and retained his seat, with one intermission (1835–37), until 1843. During this period he was prominent as a debater on the Whig side, upheld the right of petition, served as chairman of the Committee on Ways and Means in the Twenty-seventh Congress, and reported the Tariff Act of 1842, of which he was virtually the author. He sought without success the presidential nomination in 1844, and in the same year he ran for Governor of New York on the Whig ticket, but was defeated by Silas Wright (q.v.). He became Comptroller of New York State in 1847. In the following year he was elected by the Whig party Vice President on the ticket with Zachary Taylor (q.v.). Upon the death of the President, in July, 1850, Fillmore succeeded him, and the change in administration was marked by the early passage of the Compromise Measures. (See COMPROMISE MEASURES OF 1850.) Fillmore's support of those measures and especially his signing of the Fugitive Slave Law (q.v.) alienated many of the extreme Northern members of his party. Aside from the development of the slavery problem, his administration was marked by one conspicuous event—the establishment of diplomatic relations with Japan. In 1852 he was a prominent presidential candidate before the National Convention of the Whig party. In 1856 he was a candidate for the presidency on the ticket of the Know-Nothing (q.v.), or American, party, and, although supported by many conservative Whigs, such as Edward Everett (q.v.), he received the electoral votes of only one State (Maryland). He took no active part in the Civil War, and spent the remaining years of his life at Buffalo, where he died March 8, 1874.

Though devoid of many advantages in his youth, Fillmore acquired a dignity and urbanity which made him greatly respected while President. Consult: Chamberlain, *Biography of Millard Fillmore* (Buffalo, 1856); Stoddard, *Millard Fillmore* (New York, 1888); Wilson, *The Presidents of the United States* (ib., 1894); Stanwood, *A History of the Presidency* (last ed., Boston, 1898); J. F. Rhodes, *A History of the United States from the Compromise of 1850*, vol. i (New York, 1903); McClure, *Our Presidents* (3d ed., ib., 1905). For an account of his administration, see UNITED STATES.

FIL'MER, SIR ROBERT (?–1653). An English political writer, defender of the divine right of kings. He was educated at Trinity College, Cambridge, was knighted by Charles I, and was active as a Royalist during the Civil War. His most important work is his posthumous *Patriarcha; or, The Natural Power of Kings* (1680), which attempts to trace kingly right by primogeniture back to Noah and to Adam. The book was reckoned a classic defense of divine right and was answered by Algernon Sidney, in his posthumously published *Discourses Concerning Government* (1698), and by Locke, in his *Two Treatises of Government: In the Former, the False Principles and Foundation of Sir R. Filmer and his Followers are Detected and Overthrown, etc.* (1690). Filmer also wrote: *The Anarchy of a Limited and Mixed Monarchy* (1648); *The Power of Kings, and Particularly of the King of*

England (1680); *The Freeholder's Grand Inquest Touching our Sovereign Lord the King and his Parliament* (1648); *Observations Concerning the Original of Government* (1652), attacking Hobbes, Milton, and Hugo Grotius; *Observations on Aristotle's Politiques Touching Forms of Government* (1652); *Advertisement to the Jurymen of England Touching Witches, together with the Difference between a Hebrew and an English Witch* (1653).

FILOCOPO, fē-lō-kō′pō, Il. A prose version by Boccaccio, written at Naples about 1340, of the old French metrical romance *Flore et Blanchefleur.*

FILON, fē′lôN′, Charles Auguste Désiré (1800–75). A French historian, born in Paris. He was the author of many valuable works, which include: *Histoire comparée de France et d'Angleterre* (1832); *Histoire de l'Europe au XVIème siècle* (2 vols., 1838); *Histoire de la démocratie athénienne* (1854).—His son, Pierre Marie Augustin (1841–), was the tutor of the Prince Imperial from 1867 to 1870. He wrote several histories, novels, and critical reviews, such as *Guy Paton, sa vie, sa correspondance* (1862); *Histoire de la littérature anglaise* (1883), crowned by the Academy; *Prosper Mérimée* (1894); *Le théâtre anglais* (1896); *De Dumas à Rostand* (1898); *La caricature en Angleterre* (1902).

FILOSTRATO, fē-lōs′trä-tō, Il. A narrative in poetic form by Boccaccio (1341), closely followed by Chaucer in *Troilus and Cressida.*

FIL′TER AND FILTRA′TION (Fr. *filtre*, doublet of Fr., OF. *feutre*, It. *feltro*, felt, from OHG. *filz*, Ger. *Filz*, AS., Eng. *felt;* connected with OHG. *falz*, Ger. *Falz*, fold, Lat. *pellere*, to drive). The original and oftentimes the sole object of filtration is the removal of suspended matter from liquids by the mechanical process of straining. Recently science has shown that in some of its applications filtration is far more than a straining process, particularly in water and sewage purification, where, by the agency of bacteria, organic matter, both in solution and suspension, is removed or transformed, thus preventing or delaying the clogging of the filter by the latter. The end to be attained in filtration may be the securing or the recovery of matter suspended in a liquid, or the clarification or other purification of the liquid itself. The filter may be either a vessel of porous material, such as carbon in some form of baked clay, unglazed porcelain, or fine-grained sandstone, or it may be a vessel containing a granular or fibrous material, supported on a perforated bottom. Granular filtering materials may be sand, crushed quartz, powdered or crushed glass, bone or wood charcoal, crushed coke or cinders, or other substances more or less similar. Fibrous filtering material may be cotton, wool, or asbestos, either in the form of cloths or otherwise, and like substances. Both experience and theory show that in many instances the material to be filtered out adheres to the surface of the individual grains or fibres of the filtering material, often forming a layer or membrane on the surface of the walls of filter vessels. In such cases adsorption assists in the process, and the reduction of the size of the pores of the filtering medium, whether through straining or adhesion, makes it more difficult for the suspended matters to pass through. Another contributing cause is the tortuous passage through the filtering material, the several particles of the latter serving as so many dams or barriers to the progress of the suspended matters, adsorption again aiding in this process. The speed or capacity of filters, and also their efficiency or thoroughness, may be aided in some cases by the use of a coagulant, which serves to bring the suspended matters together in flakes or clots which are readily retained by the filtering material. The burden upon filters, or their tendency to clog, may be lessened in some cases by previous sedimentation. When filters deteriorate so that they give a filtrate deficient in quality or quantity, they may be either discarded or cleaned, according to their nature. Sometimes they may be washed by reversing the flow of liquid through them. See Sewage Disposal; Water Purification.

FILTER PRESSES. A combination of strainers or filters with some form of press designed to hasten the process or increase the thoroughness of separating liquids and solids. In many cases the filtering is nominal only, the filter cloth being used chiefly to retain the solid matter, which otherwise would be squeezed out between the plates or racks of the press. The force used in pressing may be applied by hand, steam, or other power, by means of simple screws or more or less complicated gearing, or air pressure may be used. Common examples of the former are the ordinary cheese and cider presses, and tankage presses used in garbage and fat-rendering establishments. Compressed air is sometimes used both to fill and operate presses dealing with matter having a high percentage of water, like sewage sludge. (See Sewage Disposal.) Hydraulic power may also be used to operate filter presses.

FILTH DISEASE. A term that may be applied to any disease caused or supported by accumulation of filth. The term, although useful, is not strictly scientific. It has been applied to typhoid fever, cholera, dysentery, and diarrhœa, as well as to erysipelas, pyæmia, septicæmia, and puerperal fever. These were called "filth diseases" on the supposition that they were caused by putrefying excrement, garbage and refuse, leakage and seepage from cesspools, privy vaults, and sewers, through which wells and springs, as well as the atmosphere, became polluted. Since the discovery that the causative principle in each of these diseases is a specific bacillus, the term "filth diseases" has fallen into partial disuse. It is known that bacteria do not pass through the air accompanying the vapor arising from a fluid, and that, in general, gases and vapors cannot convey infection, bacteria being carried by spray or dust. Yet it is true that allowing filth, particularly human excrement, to accumulate so that it may gain access to drinking water, or may attract insects which will carry it about, is to invite contamination and infection by the bacteria that may exist in such filth. Thus, flies may carry fæcal matter about and transfer it to food. Typhoid fever is spread through the medium of water or milk or other food which has been infected by the excrement of patients suffering with the disease. Want of personal cleanliness may encourage disease, and an accumulation of refuse affords a nidus for the multiplication of pathogenic germs. It is therefore clear that preventing the accumulation of filth must in a large measure serve also to prevent filth diseases. See Insects, Propagation of Diseases by; Typhoid Fever.

FILTRATION. See FILTER AND FILTRATION.

FILUM AQUÆ (Lat., thread of the stream). In law, the imaginary line running along the centre of a natural stream, which is the presumptive boundary between the lands on the opposing shores. When one conveys lands bounded by a watercourse, he is presumed, if the stream is private and the bed of it is vested in the grantor, to convey to the centre or thread of the stream. This presumption may be rebutted by a plain expression of a contrary intention in the deed, or the whole of the stream may be granted with the land on either side. But where, as is usually the case, a stream is taken as the boundary without special restriction, it is the thread, or *filum aquæ*, which is understood as the line between the riparian owners. This thread has no reference to the position of the channel, nor does its location necessarily follow the flow of the water; but it is, as a general thing, a line midway between the banks and following the contour of the shore as nearly as possible. The principle of the *filum aquæ* finds its most frequent illustration in the case of riparian proprietors in private streams, but it is equally applicable to the delimitation of frontiers between opposing states or nations or of minor political divisions. See RIPARIAN RIGHTS.

FIMBRIA, CAIUS FLAVIUS (?–84 B.C.). A Roman soldier and partisan of Marius during the civil war with Sulla. As legate to the consul Valerius Flaccus at Chalcedon, he stirred up mutiny among the troops, who murdered their consul and took Fimbria as their leader. Fimbria undertook a campaign against Mithridates, whose general, Archelaus, had invaded Greece. When in 85 B.C. Sulla, after the defeat of Archelaus, made peace with Mithridates, he turned his arms against Fimbria, who, finding himself deserted by his troops, put an end to his life (84).

Fimbria was noted for the cruelty of his treatment of the enemies of the Roman arms, and it is related of him that, having by a ruse obtained entry to Ilium, he burnt the town, which Sulla afterward caused to be rebuilt.

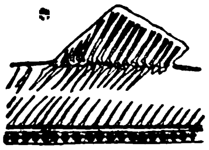
FIM′BRIATED (Lat. *fimbriatus*, fringed, from *fimbria*, border, fringe). A term in heraldry, applied to an ordinary having a narrow border or edging of another tincture.

FIN (AS. *finn;* connected with Lat. *pinna*, fin). An organ possessed by aquatic animals and used for locomotion in the water.

General Considerations. Fins are cutaneous folds which may or may not be supported by fin rays or other framework. In the squid the fins are cutaneous lobes; in pleuropods they are morphologically paired parts of the foot. Folds of skin occur on the tails of certain adult and larval Amphibia. The forelegs, or "flippers," of marine turtles and cetaceans are modified into finlike organs, besides which the tail of cetaceans ends in a fin, and a fatty dorsal fin may also be present. The fins of both turtles and cetaceans are supported by a bony framework.

Fins of Fishes. Fishes' fins may consist of mere folds of the skin, or these membranous folds may be supported by cartilaginous or bony rods, the fin rays. When the supporting rays are unsegmented, in which case they are usually strong, we have a spiny-rayed fin like the first dorsal of the perch; the whole or a part of a given fin may be spiny-rayed. Such fishes are classed as "acanthopterous." When the rays are segmented, we have soft-rayed fins, and the fishes possessing only such are classed as "malacopterous." Fins arise as folds of the skin. In young fishes these folds are much more extensive and later disappear, except in the region where the permanent fins are to develop. For the wholly different fins of certain ancient fishes, and the few existing lung fishes, see DIPNOI.

Fins are of two kinds—paired and unpaired. The paired fins, placed at or near the ventral side of the body, are the pectoral and anal, corresponding to the anterior and posterior limbs respectively of higher vertebrates. Along the median dorsal line we may have one or more unpaired fins—the dorsal fins. The caudal fin terminates the body posteriorly. The anal fin (usually one, but sometimes several) is the unpaired fin in the median ventral line of the body, posterior to the anus. In flounders and in certain fish embryos there is a continuous dorsal and ventral fold of skin supported by fin rays. In most adult fishes only isolated patches of the continuous fin remain—two dorsal, one ventral, and one caudal. See illustrations under FISH.



FIN STRUCTURE.

Diagram showing the relation of the fin bones (rays) of the dorsal fin of a teleost fish to the underlying flesh and spinal column.

Fins may be variously modified. The pectorals may be greatly broadened and lengthened and act as flying organs, as in the flying fishes. The ventral fins may be entirely absent, as in the Apodes. They may be united in a manner to produce a sucking disk, as in the lumpsucker, or the dorsal fin may be transformed into a sucking disk, as in the remora. The anals may be entirely wanting, as in certain sharks. The modifications of the caudal fin (tail) fall into two forms, proposed by Agassiz, which are characteristic of groups and much used in the classification of fishes. These forms are:

Homocercal.—A condition where the caudal fin is symmetrical as to the axis of the body; i.e., the lobes are equal, and the spine (then said to be "isocercal") ends at the middle of the base of the fin. The perch and salmon have such tails.

Heterocercal.—A condition where the upward bending of the spine and its extension into the upper lobe cause an evident inequality in the lobes, as in sharks. In this case the spine is said to be "diphycercal."

FI′NAL CAUSE. See CAUSALITY.

FINALE, fē-nä′lā̇ (It., end). The name given to that part of a musical composition which finishes the act of an opera; also to the last movement of a cyclical instrumental composition, as in the symphony, quartet, quintet, sonata, etc. The character of the finale in purely instrumental works is generally lively. In the opera it depends on the subject, sometimes being an aria alone, instead of the usual full concerted music for soli and chorus.

FINALE NELL' EMILIA, nĕl′lā̇-mē′lyȧ. A city of Modena, north Italy, on the Panaro, 27 miles northeast of Modena (Map: Italy, C 2). It has a trade in cattle and manufactures silk. Pop. (commune), 1901, 12,798; 1911, 13,422.

FI′NALISM. The view that the world's course as well as its origin is the expression of a plan having an end in view, or of plans, not necessarily harmonious. The most familiar form of this doctrine is the traditional Christian view that God has decreed the creation and the maintenance of the world for the accomplishment of ends that he thereby realizes. Finalism generally rests on a theistic conception of the universe, but it has been held by some who do not believe that one overruling Providence guides the course of events, but that what takes place is the result of the conflict and compromise of multitudinous wills, no one of which is paramount. All forms of voluntarism (q.v.) are finalistic. Finalism is opposed by mechanism, which maintains that the course of events is not determined by an end foreseen and desired, but by natural laws, blind and unforeseeing. It has been the fashion to set finalism over against determinism; but Bergson (q.v.) maintains that both finalism and mechanism are deterministic, differing only in that the former regards the determining principle as the end worked toward, while the latter regards it as the law working from behind. See DETERMINISM; MECHANISM; TELEOLOGY.

FINAL'ITY JOHN. A nickname applied to Lord John Russell (q.v.), who advocated the Reform Bill of 1831 and spoke of it as a "finality."

FINANCE' (Lat. *finantia*, payment, derivative of *finare*, to pay a fine, from Lat. *finis*, end, settlement). A term which is popularly applied to the management of transactions involving large sums of money, such as the floating of great corporate enterprises and the stock-exchange transactions incident thereto; or, on the other hand, the administration of the receipts and expenditures of nations, states, or cities. The operations first named are frequently designated "private finance," while the latter is spoken of as "public finance," or simply finance. The rules of private finance, if such there be, have not yet been formulated, and it is indeed only in recent years that economic writers have sought to coördinate the rules and principles of public finance into a science of finance. Scientific usage restricts the term "public finance" to questions affecting the expenditure, revenue, and debt of governments, although in a popular sense it is applied to questions of monetary and banking policy.

NATIONAL EXPENDITURE IN MILLIONS OF DOLLARS

COUNTRIES	1830	1840	1850	1860	1870	1880	1890	1900	1910
United States	$15	$24	$39	$63	$309	$267	$352	$590	$659
Australia	...	...	...	40	60	100	140	167	77
United Kingdom	275	260	275	345	340	400	430	641	789
Germany	...	...	...	...	...	135	320	463	756
France	201	285	300	405	...	620	685	674	860
Russia	...	...	220	312	380	533	759	746	1324
Mexico	...	...	...	...	...	23	38	28	95
Italy	...	...	...	161	222	274	371	334	510
Spain	45	55	70	105	165	165	170	181	207
Austria-Hungary	90	140	185	225	295	375	420	604	1094

The science of finance is much younger than the art of finance, and this dates only from the rise of the modern state. In the latter public needs are met by expenditure of money drawn from the people by taxation and other methods, while in the mediæval state such needs were largely met by direct personal services. These have been almost entirely superseded by the obligation to pay taxes, and by the payment in money from the public treasury for such services as are required; but there are reminders of the older system at the present time. Of these the most conspicuous is the obligation to bear arms; but a homely illustration is found in the road taxes of rural communities, which are so often satisfied by actual labor upon the roads.

While questions of public policy respecting the fiscal operations of the government form a large part of the literature of economics, it was not until the latter half of the nineteenth century that the general use of the term "finance" became common among English writers to designate this group of phenomena. The importance of this development lies in the fact that before it took place all these questions were regarded from the standpoint of the individual, instead of that of the state. The former is apt to be one of hostility, the latter at least of sympathy. While earlier writers emphasize the dangers of taxation, the oppression which it causes, the disturbances in the economic life of the community which it involves, later writers recognize certain normal activities for the government, the satisfaction of its needs by taxation as appropriate, and look upon the payments of the citizens, not as sums wrung from them by extortion, but as assessments for the maintenance of a system essential to the general well-being. This attitude has led to a fuller investigation of the facts concerned and furnishes a central point about which they can be coördinated.

The development of a science of finance as here indicated has pointed out the contrasts as well as likenesses between the management of the money affairs of states and individuals. To both the rule of economy and caution applies equally, however great the temptation in public affairs to neglect it. By its sovereign power over the citizens, the state seems to be in a position to take all it wants. This has led to the hypothesis laid down by certain writers that in private economy expenditure is measured by income, but in the economy of the state income is measured by expenditure. The epigrammatic statement is not wholly true, since among individuals expenditures are made by inroads upon capital when income does not suffice, while in the state expenditures are sometimes curtailed and more frequently postponed for lack of sufficient income. Yet, within limits, such a contrast exists and marks the divergent tendencies of public and private economy.

Public Expenditure. It is through the expenditure of public money that the state works in all of its activities, and it is the first duty of the science of finance to determine their nature and scope. Finance accepts public expenditures as a fact. It is not concerned with justifying them, either in whole or in detail. Whether a given expenditure is proper is in part a question of political philosophy, in part a question of practical expediency. The former may influence general lines of policy in this respect, though in practice each proposed public expenditure is apt to be judged on its own merits. The grounds upon which such proposals are approved or rejected lie outside the domain of finance. But the fact that expenditure is made is of prime importance, and, scrutinizing the expenditures which are actually made, finance seeks, by classifying them, to arrive at the laws of their development.

Classification of Public Expenditures. Formerly economists classified public expenditures as *necessary* and *voluntary*. This classification, based upon a definite theory of the functions of the state—a subject beyond the province of finance—obviously fails to meet the requirements of modern financial theory. A fairly satisfactory classification is that of Prof. Henry C. Adams, who classes public expenditure as protective, commercial, and developmental. The first class includes the preservation of internal peace and the defense of the nation against foreign aggression. In the second class are placed expenditures entailed by the performance of a number of functions in which the state takes the place of the private capitalist, as in the management of enterprises such as the post office, telegraphs, and railways. In the third group, developmental expenditures, are included those which the state undertakes to promote its own interests or those of its inhabitants, such as expenditures for education and other outlays which are designed to improve general conditions among the people. It is not to be understood that the boundaries of these groups can be sharply drawn. Legislative expenses, e.g., fall under all these heads. Such a classification has its value in pointing out that, besides the expenditures for protection which are essential to existence, there are others equally natural and equally unavoidable which are incident to growth and progress. The precise form which the latter take depends on local necessities and historical antecedents.

Growth of Public Expenditures. Whatever may be the theoretical justification of expenditures, however they may be appropriately grouped, finance must take cognizance of the fact that in volume expenditures are growing at a rapid rate. The evidence upon this point is cumulative, but not comprehensive. The division of authority between national and local governments materially enhances the difficulty of ascertaining the aggregate expenditures for all public purposes within a given nation. The distribution of expenditures between the national and local governments differs widely in the various countries; and for this reason it is necessary to exercise great caution in comparing the national expenditures of modern states. For national expenditures the figures are generally available. We borrow from Professor Adams a table giving the national expenditure in millions of dollars for a number of states from 1830 to 1890, to which we have added, from the latest sources, the figures for subsequent decades.

So far as these figures go they show steady advance, though it is by no means uniformly rapid, for the various countries. The significance of this advance in national expenditure can be fully understood only by a detailed study of each of the countries involved. The first consideration is the relation of expenditure to population. For the United States this is shown by the following table, taken from the Report of the Secretary of the Treasury:

YEAR	Total mills. dolls.	Per capita	YEAR	Total mills. dolls.	Per capita
1840......	$24.3	$1.42	1880.....	$267.6	$5.34
1845......	22.9	1.15	1885.....	260.2	4.63
1850......	39.5	1.71	1890.....	318.0	5.07
1855......	59.7	2.19	1895.....	356.2	5.16
1860......	63.1	2.01	1899.....	605.1	8.14
1865......	1297.6	37.34	1900.....	487.7	6.39
1870......	309.6	8.03	1905.....	567.0	7.46
1875......	274.6	6.25	1910.....	659.7	7.30

(Net expenditure, i.e., all national expenditures except payment of the national debt. In the nomenclature of the Treasury report "net expenditure" includes "net ordinary expenditure" and interest on the public debt.)

These figures show a marked difference between the period which preceded the Civil War and that which followed; they also illustrate the disturbing influence of war on the national finances. Both the earlier and the later period manifest a general tendency towards an advance of expenditure slightly more rapid than that of population. The tendency of expenditures to outrun population is characteristic of most modern states. Thus, the expenditure of Great Britain advanced from £2.31 per capita in 1890 to £3.52 in 1900, declining slightly (to £3.50) in 1910.

But the vital point is whether expenditure has outstripped wealth. Owing to the extreme uncertainty of all calculations of national wealth, this is a point which cannot be determined with absolute accuracy. They appear, however, to have kept pace with national wealth in France, but to have fallen slightly behind in the United States and considerably behind in Great Britain.

Respecting local expenditure our information is less explicit. Figures cannot be presented for as many countries. In the United States we have census figures on this point up to 1890, but no investigation into local expenditure was made in the census of 1900. In 1904 a special census inquiry was made on wealth, debt, and taxation. In 1870 local expenditures were 47 per cent of all public expenditures, in 1890 they had reached 61 per cent, and in 1904 they were 63.8 per cent. In Great Britain the share of local expenditure rose from 34 per cent in 1870 to 44 per cent in 1890 and 55 per cent in 1910. This increase in local expenditures is to be accounted for chiefly by the fact that the rapidly increasing developmental expenditures fall in great part upon the local governments. To estimate their true significance for the general welfare and for the financial outlook of a nation, the expenditures should be weighed as well as measured. In general, the growth of military expenditure is to be deplored. Yet even this has its compensations, since the army, especially in some of the more eastern parts of Europe, contributes by its training in discipline to industrial efficiency. On the other hand, the increase of the developmental expenditures must, if wisely directed, be a clear national gain. The facts can only be surmised from the general statements of public expenditure which are classified statistically by administrative departments rather than by classes of expenditure. We may cite a few facts for the national expenditure of the United States, tabulated from the Treasury statements:

EXPENDITURE IN MILLIONS OF DOLLARS

YEAR	Civil and miscellaneous *	War	Navy	Indians	Pensions	Interest on the Public Debt	Total
1870	$48.3	$57.6	$21.7	$3.4	$28.8	$129.2	$288.8
1875	63.8	41.1	21.4	8.3	29.4	103.0	267.4
1880	51.6	38.1	13.5	5.9	56.7	95.7	261.7
1885	82.9	42.6	16.0	6.5	56.1	51.3	255.6
1890	74.5	44.5	22.0	6.7	106.9	36.0	290.8
1895	82.2	51.8	28.7	9.9	141.3	30.9	345.1
1900	98.5	134.7	55.9	10.1	140.8	40.1	480.4
1905	127.9	122.1	117.5	14.2	141.7	24.5	548.2
1910	171.5	155.9	123.1	18.5	160.6	21.3	651.2
1912	172.2	148.7	135.5	20.1	153.5	22.6	652.9

* Exclusive of postal deficiencies.

The table displays in condensed form some tendencies of expenditure in recent years. The fall in the interest charge is accounted for chiefly by the reduction in the public debt, but partly by reduction in the rate on loans. (See DEBT, PUBLIC.) The expanding elements in expenditure in the recent period are civil and miscellaneous, which doubled from 1895 to 1900; war, which increased nearly threefold; and navy, over fourfold. The other major item, pensions, increased somewhat in the same period, but has since manifested a tendency to decline.

Comparison of National Expenditures. A comparison of the budgets of leading nations to show the place occupied in each of the several classes of expenditure is an inquiry which tempts the student, but which is confronted with well-nigh insurmountable difficulties. The most serious is the fact that while data for the finances of the several local governments are frequently missing, the distribution of functions and therefore of financial responsibility between the nation and the various subordinate governments differs greatly in the several States. This distribution rests upon constitutional provisions and administrative regulation. In comparing national budgets we find little that is common to all except the expenses of foreign intercourse, national defense, and public-debt charges. To ascertain, therefore, the proportional costs of the several items of public expenditure would require a compilation of all the expenses of all the local governments in addition to the figures for national expenditure. The lack of figures for such local expenditure renders a statistical study of national budgets, without note or commentary, valueless.

Another obstacle to a simple comparison of national budgets lies in the varying extent to which the nations concerned undertake industrial functions. The inclusion of the postal expenditures would add 229.9 million dollars to the aggregate for the United States in 1910. In most national budgets the postal service is included, but this is not true of Austria-Hungary. The French national budget is charged with the expense of operating the tobacco, matches, and gunpowder industries, together with the expenditures due to the management of the state forests and domains and the rather limited system of state railways. The Russian budget bears the costs of operation of the alcohol and tobacco monopolies, of the railroad system, and of the state domains. A more common illustration is offered by Prussia, where the cost of operating domains, mines, and railways is about half the aggregate expenditure.

Local Expenditures. It has already been pointed out that local expenditures grow more rapidly than national expenditures, and a few figures indicative of the extent and nature of such local expenditures may be adduced. Rather than single out particular localities, it is better to have resort to the figures furnished by the U. S. census report on *Wealth, Debt, and Taxation* of 1904. The expenditures for governments of all grades were as follows:

National Government	$617,530,137
States and Territories	185,764,202
Counties	197,365,827
Cities (over 2500 inhabitants)	468,637,749
Other minor civil divisions	222,682,884
Duplications	69,646,242
Total (less duplications)	$1,621,734,557

The expenditure for schools is distributed among the States, counties, and municipalities. The character of expenditure of the national government having been already noted, we may cite from the census the following statement for local expenditure:

Legislative	$7,301,068
Executive	2,562,847
Law offices and accounts	7,176,691
Finance offices and accounts	10,725,828
Miscellaneous general government	18,004,135
Courts	39,934,902
Military and police	54,551,829
Fire department	38,185,709
Miscellaneous protection to life and property	3,735,576
Health and conservation	9,460,530
Sewers, drainage, and other sanitation	26,417,947
Street lighting	22,919,288
Other highway expenditures	93,861,687
Charities	58,400,438
Insane	23,021,207
Penal institutions	24,426,029
Education	281,219,278
Parks and recreation	14,625,414
Agriculture	3,230,660
Interest	78,902,287
Industries	32,064,304
Investment expenses	156,846
Outlays	208,475,012
All other	19,098,160

Public Revenue. The revenues of the state are chiefly derived from taxation, but this is not the exclusive source of income. Omitting minor or casual sources of income, such as fines and gifts, the state derives a revenue from the management of its own property, from its industrial activities, and from other services which it renders to the community. Nomenclature is by no means fixed, but we may designate the sources of income as prices, charges, fees, and taxes.

1. *Prices.*—Under the head of prices we may include the revenue arising from the sale of public property, such as land or its products. By price we mean a return fixed in the main by private competition. Such a return can be obtained when there is no monopoly of the property to be sold. Whether or not such shall be the aim of the state depends largely upon questions of public policy. As an owner of property, the state is trustee for the people, and a wise policy may in some cases dictate the neglect of commercial interests, while in other cases it may require that they be strictly adhered to. Wherever the state has possessed large domains fitted for agricultural uses, as in the public lands of the United States and of Australia, such lands have been used rather to promote national development than to insure public revenue. Products incidental to the functions of government, such as the lumber from state forests or goods produced in penal establishments, must, if brought into the market, be sold at market prices, lest the state should injure its own citizens. The revenues from these sources are but a small portion of the income of modern states.

2. *Charges.*—Charges may serve as a general term for the amounts paid for specific industrial services which the state performs. These include the operations of the post office, the telegraph, the telephone, the railroad, municipal gas and electric plants, and the sale of certain products such as liquors, tobacco, matches, etc. The range of industrial activity represented, though of course not equally extensive in the various modern states, is varied and comprehensive. In all there is a common feature, public monopoly, which makes the term "charges" for public service more appropriate than "prices." The determination of the charge rests upon the motives which lead the state to enter upon a specific kind of industrial activity. That motive is seldom to obtain the largest possible revenue from the enterprise, although this characterizes fiscal monopolies, such as tobacco and match monopolies, which are frequent upon the continent of Europe. The liquor monopoly as it exists in Switzerland is not wholly fiscal in its purpose, as it seeks to eliminate some of the abuses which grow out of the private production of spirituous liquors. Far more obvious are the social interests involved in the government management of gas and electric-lighting plants, railroads, telephones, telegraphs, and the postal service. In the measure in which these social interests are regarded in fixing charges must the revenue-producing character of the industry be superseded. Hence the tendency under government management to render services at cost. This is well illustrated in the history of the postal service, which in some states has ceased to be a source of net revenue. This feature should be carefully considered in all proposals for the assumption of various branches of industry by the state. From a purely fiscal point of view there is generally greater advantage in private ownership subject to taxation than in public ownership.

3. *Fees.*—Fees are payments for definite services rendered by public authorities in the administration of public business. Such are court fees, license fees, and the like. They are based upon the theory that a special service is rendered to those who pay them over and above the general social service which the operations of government imply. As the benefit derived by the individual is intangible, there can be no question of an exact equivalence between the payment and the service rendered. The only rule which can be fixed is that they should not be so oppressive as to interfere with the orderly conduct of public affairs. Thus, marriage fees, either to the state or church, should not be so high as to promote unions not legally sanctioned. Court fees should not deprive the poorer classes of the protection of the law. Similar to fees in their nature are the taxes called *special assessments* in American finance. When a street is opened or a highway improved, while the public receives a benefit, yet the chief advantage is frequently enjoyed by the owners of the abutting real estate. For this they are compelled to pay by a special rate levied upon such real estate. Special assessments, like fees, contain therefore an element of commensurable private advantage. Unlike fees, they are levied upon real estate and are applied for the purpose of enhancing the value of that real estate. See TAX.

4. *Taxes.*—In the three kinds of payment thus far discussed there is in general a direct benefit to the individual, and the payment is made only in exchange for a direct service of the state. In this they differ radically from taxes. The latter are forced contributions to the public treasury. In practice, as in the most advanced financial theory, taxes rest upon the duty of citizens to support the state. The benefits which the citizen enjoys from the existence of government are general and not specific, and no attempt to establish a parallel between such benefits and tax payments can be successful. Writers on finance have indeed frequently attempted to justify taxation on the ground that government renders an equivalent service in protection to person and property; but there is obviously no demonstrable relation between the payments which may be exacted from individuals in taxation and the protection afforded them. Taxes are based, then, upon the duty of citizens to support the state of which they are members; and the measure of such duty is found in their ability to bear a share of the burden. For a comprehensive treatment of the theory and practice of taxation, see TAX.

REVENUES OF THE UNITED STATES FOR THE FISCAL YEAR ENDING JUNE 30, 1912

Prices, from sales of:	
Public lands	$5,392,796
Indian lands	3,264,763
Ordnance material	224,732
Government property	2,782,028
Charges:	
Postal service	246,744,016
Fees:	
Consular, letters patent, land	4,478,829
Customs fees, fines, penalties	1,387,114
Immigrant fund	3,336,519
Taxes:	
Internal revenue	321,612,199
Customs	311,321,672
Revenues, District of Columbia	7,774,381
National banks	3,637,008
Not classed:	
Chinese indemnity	105,081
Profits on coinage, bullion, deposits, etc.	6,970,159
Judicial fees, fines, penalties	1,274,839
Forest reserve fund	2,158,344
Other receipts not classed	16,202,203
Total ordinary receipts together with postal	**$938,646,689**

Revenues of the United States. In modern nations taxation greatly overshadows all other sources of revenue. This is brought out in a detailed statement of the revenue of the United States for the fiscal year ending June 30, 1912, in which the sources of income are arranged, so far as practicable, by classes.

It would be possible to carry the classification into further detail, and to place under the main heads a number of items falling together under receipts not classed. In each case the receipts are gross, without deduction for expenditures connected therewith, which may in some cases exceed the receipts.

RECEIPTS OF THE UNITED STATES IN MILLIONS OF DOLLARS

Year	Total	Customs	Int. Rev.
1840	$19.5	$13.5	.....
1845	30.0	27.5	.....
1850	43.6	39.7	.....
1855	65.3	53.0	.....
1860	56.1	53.2	.....
1865	322.0	84.9	$209.5
1870	396.0	194.5	184.9
1875	284.0	157.2	110.0
1880	333.5	186.5	124.0
1885	323.7	181.5	112.5
1890	403.1	229.7	142.6
1895	313.4	152.2	143.4
1900	567.2	233.2	295.3
1905	544.2	261.7	234.0
1910	675.5	333.6	289.9
1912	691.7	311.3	321.6

Revenues of Various Nations. The comparison of revenues of foreign countries is beset with difficulties similar to those which are encountered in comparing their expenditures. Just as there are certain unquestioned functions of national states, so there is at least one unquestioned source of national revenue, viz., customs duties. But with it are found associated other forms of taxation, both indirect and direct, and other forms of income, according to the scope and variety of the functions exercised by the national government. The most marked contrast between the United States and Great Britain on the one hand, and the continental countries on the other, is in the extent among the latter of industrial income.

Local Revenues. The most comprehensive statement of local revenues in the United States is given by the census report on *Wealth, Debt, and Taxation*, for the year 1902. According to this report the revenues of the several local governments were as follows:

States and Territories	$189,165,067
Counties	199,119,468
Cities over 25,000	424,763,472
Cities 8,000–25,000	75,216,973
All other minor civil divisions	219,304,262
Total	$1,107,569,242

The sources of local revenue are classified under general revenues, amounting to $934,629,816, and commercial revenues, such as receipts from public industries aggregating $172,939,426. The general revenues are classified as follows:

General property tax	$706,660,244
Special property and business tax	62,327,400
Poll taxes	16,581,786
Liquor licenses	55,241,197
Other licenses and permits	19,841,348
Fines and forfeits	7,962,322
Subventions and grants	60,984,892
Donations and gifts	2,903,477
All other	2,127,150

Public Debt. A third division of the subject of finance concerns public credit and its use. As the creation of public debt often required by the exigencies of national life rests upon the public credit, a complete theory of finance must concern itself with the means by which public credit is established and maintained, as well as the methods by which it is drawn upon for the support of the public finances.

Like the credit of individuals, public credit rests upon confidence; and like the credit of individuals, such confidence rests upon past performance of obligations incurred. Without a sacrifice of sovereignty the state can offer no other guaranty to its creditors. It is true that in certain cases the obligations of one government have been guaranteed as to interest and principal by the government of another state, as in the case of the Egyptian bonds guaranteed by the English government. But in such a case the power which guarantees tends to extend its sovereignty over the government which contracts the obligations. Again, governments have sometimes set aside the receipts from certain revenues, as, e.g., customs, for the payment of interest obligations; but without good faith this guarantee is of little value unless such revenues are placed under foreign administration, as was the case of the customs revenues of Santo Domingo, administered primarily in the interest of foreign creditors by officials named by the President of the United States. Such a plan, while it may support the public credit, is usually regarded as highly objectionable on account of the abdication of sovereignty it entails.

The basis of public credit is therefore the ability of the state to fulfill its contracts and the punctiliousness with which it actually does so. Public debts are therefore bonds without mortgages or similar security. They are primarily contracts to pay interest, but may include also an obligation to pay the principal, either in whole or in part. Usually, in European countries, no fixed date is set for the repayment of public debt. A different policy is pursued by the United States. See DEBT, PUBLIC.

Sinking Fund. Provision for the payment of public debt is sometimes made by the establishing of a sinking fund. A sinking fund contemplates the gradual extinction of a debt, provided by the law authorizing the debt, and while it has been discarded in the practice of the more advanced nations, is sometimes used by the nations of weaker credit. It is needless to say that the faithful fulfillment of the condition when it exists tends to support public credit. Sinking funds may assume various forms, but the principle is simple. The state guarantees an annual appropriation, as, e.g., 1 per cent of the principal of the debt, which is used to repurchase a part of the debt in the market. The bonds so purchased are not destroyed, but are set apart in a separate fund or sinking fund and continue to draw interest. The interest of the first year's installment to the fund plus the second year's installment is used to purchase bonds. By this process carried out the government in time acquires possession of all its own bonds, which are then destroyed and the debt canceled. This plan seems very simple and in the early part of the nineteenth century was widely adopted. Its defects are, first, that the state has not always the money available for such an appropriation; second, that it is not always expedient to purchase bonds in the market because of the premiums upon them, and, third, that such a reserve of unredeemed securities can with difficulty be maintained inviolate in times of emergency. In view of these defects, sinking-fund arrangements planned in this way by statesmen like Pitt and Hamilton have never been followed to their logical conclusions. Modifications of one sort and another have been introduced which have left of the original institution little more than the name. This is shown in the history of the sinking funds in the United States, especially that of 1862. By the Law of Feb. 25, 1862, it was provided that, after the gold receipts from customs had been used to pay the interest, they were to be applied "to the purchase or payment of one per centum of the entire debt . . . to be made within each fiscal year, which is to be set apart as a sinking fund, and the interest of which shall in like manner be applied." No obligation could be more formal, yet it was not formally observed. No attention was paid to this provision after the war, and at its close the payments and purchases did not proceed in the orderly fashion prescribed by law. The surplus revenues which for a time were abundant were used for the cancellation of debt far more rapidly than had been contemplated by the law. Nor were the bonds called in or purchased retained as a fund, for by the Law of July 14, 1870, it was ordered that they be canceled and destroyed, and that an amount equivalent to the interest upon such canceled bonds be paid annually into the sinking fund. In the subsequent history of the country there were epochs in which there was no debt cancellation, others in which it proceeded rapidly, just as the condition of the revenues permitted. Congress and the Treasury Department have been satisfied by the explanation that the aggregate debt reduction has been far greater than that contemplated by the law. The sinking fund to-day therefore stands practically as an expression of the policy of debt reduction, and of the authority of the Secretary of the Treasury to purchase bonds in the market for this purpose, and has no other significance. The expression occurring in financial reports of purchases for the sinking fund means simply for debt repayment.

Whenever the financial condition of the nation warrants a repayment of debt there are simpler methods of proceeding than sinking-fund arrangements. Bonds may either be called in or may be purchased in the market. Theoretically purchase in the market is preferable when the bonds are below par, but as this condition is not likely to occur in any state which has a surplus for debt payment, the case is of no practical importance. On the other hand, the terms of the contract may be such as to prohibit calling in the bonds, as has been the case in the United States, and leave no way of redemption open except purchase at a premium. In such a case the premium paid is to be compared with the saving of interest which would have to be paid during the unexpired term of the bond before redemption becomes optional. Much more suitable, therefore, for the purposes of fiscal administration are bonds which are not limited as to term of payment, but which can be redeemed at their face value at the will of the government.

When there are no specific sinking-fund attachments to public debts, the repayment of public debt might be regarded, so far as the contract with creditors is concerned, as a work of supererogation. But just as a business man gains in credit by prompt or anticipated payments, so a policy more liberal to creditors than legal requirements demand redounds to the credit of the state. Repayment of the principal is not essential, as we have seen, to the maintenance of public credit, as states whose debt continues to increase stand in good repute, but is a policy to be recommended. Of its utility as an outlet for surplus revenues we shall speak in discussing financial policy. For conversion of public debts, see DEBT, PUBLIC.

When loans have been raised for industrial purposes there are valid reasons for the adoption of a fairly rigid sinking-fund policy. As we have seen, it is customary to operate many public industries on the principle of covering costs, but without surplus profit. Charges should be fixed at a level sufficient to sink the principal of the loan before the equipment of the public industry wears out or becomes obsolete, and such a policy would involve the maintenance of a sinking fund. This principle of finance, though unquestionably sound, has found only occasional observance in practical financial policy.

Having considered public debt in relation to public credit, we may briefly outline its relations to fiscal operations. The creation of debt is a source of revenue which serves to equalize the difference between public expenditures and ordinary revenue. This difference may be caused by irregularity of revenue or casual deficit. Loans are then required in anticipation of revenue, and in such cases they should be temporary, of short duration, subject to redemption at will or in a brief period. If at the expiration of this period there is no accumulation of funds available for payment, the only alternatives are an extension of the loans or their incorporation in the funded debt. The difference between ordinary revenue and expenditure may be caused by a national emergency, such as war, to provide for which the ordinary sources of income, however stretched, are wholly inadequate. Or, again, the difference may be caused by the investment in great public works, which either in their effect on the general tax-producing capacity of the people or by revenues appropriate to themselves are expected to pay for themselves in the long run. In the cases named a resort to funded debt is the only way open by which to meet such expenditures. For a further development of these principles, see DEBT, PUBLIC.

Financial Policy. The aim of financial policy can be summed up as the attainment of adequate revenue, a revenue adequate to fiscal needs and responsive to changes in them. This involves the questions of distribution of sources of revenue and elasticity of income.

The separation of government into national and local authorities, with the interposition of a third class of regional authorities in the case of Federal States, brings with it a division of expenditures and the need of adequate revenues for each form of government. The ideal of independence in action within their several fields can only be realized when to each are assigned certain independent sources of revenue. Without such revenues these authorities become mere disbursing offices lacking vitality. The problem of proper revenue is the most serious one which confronts the maintenance of a distribution of authority sanctioned by usage or proposed by legislation. It is a question of practical statesmanship, which must in each country take into consideration the facts of national development and cannot be decided upon general financial or political principles.

The question at issue is partly one of law and partly one of fact. What sources of income does the law allow to the several bodies, and are these in fact suitable? In the United States the Constitution gives the Federal government the power to collect taxes, duties, imposts, and excises, but prohibits it from imposing a capitation or other direct tax except in proportion to the population. This in fact excludes the Federal government from the field of direct taxation, which is left to the States. The interpretation of the term "direct taxation" has varied in different periods of American history. The practical effect of the varying interpretation of the term is illustrated in the history of the Federal income tax. Such a tax was levied in the time of the Civil War and was held to be a constitutional exercise of the Federal taxing power. The income tax was in 1894 declared to be a direct tax, and therefore unconstitutional, by the Supreme Court. An amendment to the Constitution authorizing the Federal government to levy income taxes received the necessary adhesion of the States in 1913, and an income-tax law was passed in the same year. (See TAX.) Should the nationalization of railroads demanded in many quarters ever become a fact, it would withdraw from the States an important and remunerative object of taxation. Given the present functions of the Federal government, the revenue opportunities have proved ample for its purposes.

In the States the revenue question is more perplexing. Except that they may not impose customs duties, there is no limitation upon the power of the States. But since the needs of the State governments are relatively small as compared with those of local governments, the relation of the two is of great importance. It cannot be said that there is anything like a system in the actual distribution of revenue sources between the two forms of government. It must, however, be obvious that the orderly development of each requires that well-defined sources of income be assigned in such a way as to satisfy the more rapidly increasing necessities of the local governments.

A revenue system should therefore supply current needs, should increase in productiveness as those needs increase, and should moreover be regular in its returns and capable of meeting the fluctuations of financial necessities. The customs revenue is peculiarly subject to fluctuation, and a State which relies solely upon it is exposed to serious embarrassment. This is well illustrated in the financial history of the United States, and depicted in the table of receipts of the United States, given previously in this article.

Imports on which these revenues are based follow the vicissitudes of trade and reflect the hope or fear of tariff changes. Far more regular has been the productiveness of the internal-revenue taxes imposed by the United States. To meet these fluctuations of revenue from certain sources, as well as to meet fluctuations in the need for money, the financial system of every nation needs some elastic element, some tax whose productiveness can be reduced or augmented, as the case may be. The United States may be said to have such a source of revenue in the internal-revenue system. When drawn upon for the increased expenditure for the war with Spain, the effect upon the revenue was rapid and considerable. But nowhere else has this element of elasticity attained the importance which it has assumed in England, where the income tax is used for this end. In the United States it has not been necessary to increase or reduce taxation frequently, since in the past 30 years there has generally been a surplus revenue which has been applied to debt reduction.

Local Finance. As a result of the division of authority and functions between central and local governments, a distinction is coming to be clearly drawn between general and local financial operations. The extent of the latter has been treated at the beginning of this article; it is here necessary to emphasize some of the chief principles of local as distinguished from general finance.

Expenditures.—Those expenditures which result in purely local advantages are most naturally borne by the local government. Such, *e.g.*, are those which are incurred for local improvements and the costs of local administration. Besides these expenditures, there are some which are of general interest, but are best placed under the control of local bodies, so as to be more nearly under the supervision of the public. Examples of expenditures of this kind are those which are incurred in the support of primary education and for poor relief and the administration of justice. It is these classes of expenditures which are increasing most rapidly.

Revenue.—If local government is to possess real autonomy, it must possess independent sources of revenue. Certain classes of taxation cannot be employed by local governments. Such, e.g., are the income and general excise taxes, import and export duties; taxes on bequests and inheritance. These forms of taxation are difficult to collect by local authorities; and if practice is not uniform throughout the state individuals and industries will escape taxation by shifting from one locality to another. There remain taxes on real property and on local occupations. Neither of these objects of taxation can escape the local assessor. Franchise taxes frequently afford a considerable local revenue. Further revenues may be secured through charges for special benefits, e.g., water rates, and special assessments (q.v.) may be employed to cover the outlay for some of the more burdensome local improvements. It remains true, however, that the revenues which can be obtained from local sources are frequently insufficient to cover the expenditures which are incurred by the local government. In many countries it has become customary to supplement local revenues by grants from the central treasury. In England, up to 1887, many grants for specific purposes were made; since that year various duties, collected by the central authority, have been marked off for local uses. In the United States the most familiar application of this principle is the grant of State funds for educational purposes.

Debt.—The local government, even more than the central authority, is often compelled to incur debts to cover the cost of undertakings which are too extensive to be paid for out of current revenues. A large proportion of local expenditures are *productive* and should therefore be met by loans which distribute the cost over a long period. Local authorities are, however, frequently inclined to be reckless in the expenditure of resources thus gained. For this reason the central government usually exercises close supervision over the creation of local debts. In the United States State constitutions frequently fix a limit beyond which localities cannot go in incurring debts; in many cases debt limitation is provided in municipal charters. In Great Britain a special act of Parliament is required in order to authorize a municipal loan; and a similar practice is followed in France and other continental countries. In England the central government acts as an intermediary in securing loans for local bodies, thus giving to the latter the advantages of the national credit; in Belgium the national treasury keeps a fund out of which loans are made to municipalities; and in Germany some part of the workingmen's insurance funds administered by the state government are loaned in this manner. See TAX; MUNICIPAL GOVERNMENT.

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WAR FINANCE

The coming on of the European War naturally introduced a very great change into national financial practice as well as financial conditions, although war experience subsequent to 1914 vindicated rather than altered the conclusions and theories which had been developed as a result of prewar experience. Probably the most striking feature of the European War from the financial standpoint was the enormous expansion of the expenditures of central governments all over the world; conspicuously, of course, those of the belligerent nations. Coincidently with this great expansion in public expenditure, followed the necessity of great increases in public income; and from the latter came the necessity of new types of taxation, as well as unprecedentedly high rates under old taxes. At the same time there occurred a vast enlargement of public debt, due to the fact that even with the most urgent effort to equalize budgets by means of taxation, war expenses had become so excessive as to necessitate a very heavy resort to borrowing. Although, as elsewhere noted, public finance necessarily relied, so far as practicable, upon taxation as a means of obtaining needed revenue, it was true that, practically from the beginning of the war, nations recognized that it would be essential to borrow heavily with a view—it was true—to later refunding and perhaps partial cancellation, but with the distinct expectation that the debt thus created would continue in effect for a great while.

In studying war finance a beginning should be made by reviewing expenditures during the period of belligerency and immediately thereafter. These may then be compared with the figures already given (page 552) for peace outlays. The table below surveys the expenses of some of the principal countries.

Incomes of Chief Countries. In order to make provision for these enormous expenditures the various governments almost from the outset of the war sought to increase taxation, although this plan was resorted to in a very varying degree. In some countries, notably Germany, the belief that the war would be short and that its cost could best be met by borrowing led to a limitation of new taxes and a substitution of loans, so that war finance was largely concerned with borrowing, either through popular loans or through short-term borrowing at banks. In others, however, it was recognized from the beginning that action designed to provide an adequate basis of taxation was absolutely essential, and accordingly new methods of taxation were devised and applied. In the table on the following page, is furnished a survey of the income from taxation and other sources (non-borrowing) obtained by each of the principal countries during the war period.

NATIONAL EXPENDITURE
(000,000 omitted)

COUNTRIES	1914	1915	1916	1917	1918	1919	1920	1921
United States	$ 700	731	723	1,935	12,697	18,515	11,476	3,973
Australia	£ 106	158	327	408	620	492	472	336
United Kingdom	£ 197.5	498.6	1,559.1	2,198.1	2,696.2	2,579.3	1,666	1,195
Germany	mark 8,654	25,708	27,723	49,098	53,360	46,966	61,471	188,292
France	franc 6,589	22,804	29,536	36,345	39,419	49,026	52,183	44,412
Russia	rouble	2,898	3,647	4,078	47,677	230,000	....	....
Italy	lire 2,262	5,428	10,557	17,146	25,329	32,454	23,121	24,988
Austria Hungary	kronen 5,210[1]	6,048	....	....	25,612	....	....	....
Japan	yen 574	648	583	591	584	807	1,064	1,335
Canada	$ 127	197	296	456	522	712	347	537

[1] 1913.

Chief Sources of Taxation. While there was no uniformity of taxation throughout the world during the European War some general features may be regarded as practically identical in most countries. Among these was an early resort to income and excess profits taxes. Of these types of taxation the best examples were afforded by the legislation of Great Britain and the United States. Great Britain was naturally first in the field and having first attempted to provide for her necessities by means of an advance in the rates of taxation it was determined to undertake new types of levy in that field. In 1914 Great Britain accordingly doubled the rates of the income tax and imposed additional internal revenue or excise duties; these, however, speedily proving insufficient and being succeeded by new legislation adopted early in 1915.

NATIONAL (GOVERNMENTAL) INCOME
(000,000 omitted)

COUNTRIES	1914	1915	1916	1917	1918	1919	1920	1921
United States	$ 735	698	780	1,117	3,665	5,152	6,695	5,625
Australia	£ 21.7	22.4	30.8	34.1	36.8	44.7	52.8	65.5
United Kingdom	£ 198.2	226.7	336.8	573.4	707.2	889.0	1,339.6	1,418.3
Germany	mark 2,350.83	1,735.20	2,029.43	7,830.12	.....	.....	8,400	46,100
France	franc 1,239	4,113	4,641	5,811	6,987	10,177	20,000	23,000
Russia	rouble	2,878	3,647	3,999	16,583	48,000	.....	.....
Italy	lire 2,262	2,155	2,702	3,722	4,645	5,560	.....	.....
Austria Hungary	kronen 5,210[1]	5,724.8	.....	8,663	.....	.....	.....	.....
Japan	yen 549	509	513	595	486	664	1,064	1,335
Canada	$ 163	133	172	233	261	310	246	.....

[1] 1913

NATIONAL EXPENDITURE
(000,000 omitted)

COUNTRIES	1914	1915	1916	1917	1918	1919	1920	1921
United States	$ 700	731	723	1,935	12,697	18,515	11,476	3,973
Australia	£ 106	158	327	408	620	492	472	336
United Kingdom	£ 197.5	498.6	1,559.1	2,198.1	2,696.2	2,579.3	1,666	1,195
Germany	mark 8,654	25,708	27,723	49,098	53,360	46,966	61,471	188,292
France	franc 6,589[1]	22,804	32,945	41,680	54,537	49,039	52,064	44,412
Russia	rouble	.....	.....	.....	.....	.....	.....	.....
Italy	lire 2,262	5,428	10,557	17,146	25,329	32,454	23,121	24,968
Austria Hungary	kronen	.....	.....	.....	.....	.....	.....	.....
Japan	yen 574	648	583	591	584	807	1,064	1,335
Canada	$ 127	197	296	456	522	712	347	537

[1] Figure for second half of 1914. Figure for 1913—4,718.

This legislation was practically forced by the fact that from April 1, 1915 to March 1, 1916, government outlays had been met to the extent of about 84 per cent by means of borrowing. The new plan of 1915 accordingly provided for an increase of normal income tax rates to 3s. 6d. in the pound, while a super tax increasing at a progressive rate from 10d. to 3s. 6d. was imposed upon incomes ranging from $12,500 to $50,000. For the first time, the excess profits tax was introduced at the rate of 50 per cent on incomes which had been earned during the months from Aug. 1, 1914 to July 1, 1915. A basis for the levy of this tax was afforded by authorizing the contributor to establish a basic prewar income representing the average returns for any two of the three years preceding the war. Receipts in excess of the amount thus obtained by the taxpayer over and above his average prewar income were taxable at the 50 per cent rate already referred to. This system of taxation was continued throughout the war, although from time to time with changes of rate and extensions of the number of taxable objects as circumstances seemed to require. Customs taxes were decidedly raised and the rates on alcoholic drinks advanced almost to prohibitive points. Stamp duties and luxury taxes were also added and proved more or less productive although in varying degrees.

The United States did not enter the war until April 6, 1917, and as in the case of Great Britain found it necessary to defray her early expenses by means of loans rather than by taxation. No actual revenue measure was put into effect prior to June 30, 1917, which was the end of the fiscal year, but the question of tax legislation was taken under advisement and on October 3 of that year a measure whose yield was estimated at $3,400,000,000 was enacted by Congress. This provided for income surtaxes and an excess profits tax on the same basis as that of Great Britain. An abortive measure adopted on March 3, 1917, had provided for an excess profits tax which, however, had not been collected, so that the act of Oct. 3, 1917, was the first real war revenue measure. Exemption of incomes was fixed at $1,000 for unmarried persons and $2,000 for married persons and the normal tax rate was set at 2 per cent on incomes over these amounts. Surtaxes beginning with a rate of 1 per cent on incomes over $5,000 and running up to 50 per cent on incomes in excess of $1,000,000 were imposed. The excess profits tax was levied on business incomes in excess of an amount equal to a maximum of 9 per cent return on the capital employed by business on the average during the years 1911–13. On all excess incomes as thus ascertained, a profits tax ranging from 20 per cent for the first 15 per cent up to 60 per cent on everything over 33 per cent was imposed. The result was to bring in an enormous return to the Treasury which however was still far behind the necessities of the Treasury, and according it was undertaken to enact new legislation about the middle of 1918, designed to enlarge the income yield. This legislation was modified as a result of the announcement of the Armistice, but nevertheless took effect in a form which greatly added to the burden of the public. Normal tax rates were set at 12 per cent for 1918 and 8 per cent for later years, while the surtax was altered and applied in such a way as to make it very much more thorough and more burdensome, its rates now running up to 77 per cent on incomes in excess of $1,000,000.

Taxation in France followed a somewhat different course from that which was pursued in England or the United States, owing to the different attitude of the public toward taxation. The first legislation on the subject made its appearance in 1914 when measures were adopted with a view to providing a regular income in future years. This tax, however, was first made effective in 1916 and applied to all incomes in excess of $1000, although with suitable exemptions and allowances for dependents. The tax was 2 per cent as a basis but with progressively increasing rates, while accompanying it were excess profits taxes levied at the rate of 50 per cent upon a basis practically similar to that adopted by Great Britain. On July 1, 1916, a special war levy was made on all citizens who had not actually been compelled to serve in the army while higher taxes were levied on incomes from investments, and extensive internal revenue taxes occupied with heavy fees and stamp dues on postage, telegrams, and the like were also introduced. A part of these taxes, however, did not come into effect until the year 1917. Additional taxes were agreed upon just at the close of 1916, with severe penalties for nonpayment, while in 1917 it became necessary once more to amend the income tax and obtain some modifications in the existing system. Among these was a tax of 4 per cent on all business profits with special levies on the volume of retail business (a kind of sales tax). In 1918, income tax rates were still further raised and luxury taxes were introduced although with somewhat questionable effect.

Germany, as already seen, had been under the impression that the war would be a short one and that taxation need not be carried far. Accordingly the early war period in Germany was financed largely by means of loans and bank accommodation, the first substantial increase in taxation being provided by the Act of 1915, at which time the several German states materially increased their local direct levies upon the citizens. The imperial government in 1916 in order to meet recurring deficits enacted war profits taxes in addition to internal revenue duties and excess profits taxes. These measures were adopted on June 5, 1916, and were followed by an advance of 20 per cent in the war profits tax beside taxes on coal and railway traffic and on a variety of objects and transactions. Action, however, was slow and receipts were small up to the middle of 1917. In 1918 there was an extension of the internal duties as well as increased taxation upon war profits, but Germany still refused to resort to the heavy taxation on incomes and estates which had been adopted by her principal opponents. Up to the close of the war, she continued to hold back not only in connection with taxation, but also in enforcement of existing taxes applying them only upon an incomplete and unsatisfactory basis with correspondingly poor yield, reliance being chiefly placed upon short-term borrowing and currency note issues and largely upon the large public loans which were floated through popular subscription. A like policy was pursued in Austria taxation being considered already very burdensome so that extreme reluctance to the levy of new taxes was felt at the outset. However, in 1916, it was found necessary to increase the rate of existing taxes and in 1917 new methods of taxation were called for. Very little progress however was made in introducing them, the government continuing to rely upon loans and bank borrowing.

Italy, on the other hand, recognized the necessity of a resort to taxation practically from the very beginning of the war, enlarging the previously existing rates under the act of Oct. 15, 1914, and then providing a substantially heavy income tax with a provisional excess profits tax and a great variety of temporary expedients of one kind or another borrowed evidently from the experience of Great Britain and of France. In 1916, further effort was made to enlarge taxation, but little success was secured owing to the disruption of business conditions, although the tax on war profits was materially enlarged and some success was had in collecting it. In 1918 great extensions of luxury and consumption taxes were made and in 1919 a supplementary income tax was resorted to.

In other countries a variety of fiscal expedients were resorted to. The southeastern states of Europe were not very successful in collecting taxes and found it necessary to provide funds through issues of paper currency, popular loans, and foreign borrowing. Japan was in a peculiar position, owing to the fact that although a belligerent her expenses were not very greatly increased during the war, her national debt in fact being materially reduced. Some reductions in land taxes were effected, while prewar income taxes were also rendered much less burdensome, through various types of modifications. In the neutral countries, including the Scandinavian states, Holland and others, special problems existed which grew out of the demands resulting from the war involving as these did an enlargement of public expenditures more than three fold. The advance in taxation in such countries as Holland, Switzerland, and Scandinavia varied considerably, some of the countries contriving to avoid a very great increase in direct taxes as compared with indirect taxation, although in nearly all it was necessary to borrow heavily abroad as a means of meeting the tremendous increases which had taken place in the cost of carrying on government.

Relations With Banks: As has been seen, it was true in nearly all of the European countries that they were taken by surprise at the opening of the war and found it necessary to fall back on bank loans in order to provide themselves with the funds absolutely necessary to meet their requirements. This, as noted elsewhere, was an inevitable episode in war finance and was not open to criticism save in so far as it might be adopted as a systematic policy. Unfortunately in several countries fear of popular dissatisfaction led the financial authorities to make this method of temporary financing practically permanent. Indeed it may be said that of all the countries which were affected by the European War, whether through direct belligerency or in some indirect way, the only ones which had the national solidarity to tax themselves severely and make the taxation really effective were Great Britain and the United States. Other countries were divisible into two classes: Those which like Germany made but little effort during the early war years to impose new taxation and those which, like Italy, while imposing the taxes in theory, found it hard to collect them in practice. In falling back upon the banks, the various governments resorted to methods of advance which had not been tried in any such form in former struggles. Relatively small use of legal tender paper or "fiat money" was made but the banks were required to take and distribute short-term obligations which were then funded from time to time into longer term loans as circumstances seemed to permit. The fact that the subscribers to these loans were encouraged to borrow from the banks the funds which were necessary in order to enable them to make good their subscriptions naturally tended to produce in all countries a highly inflated condition of prices, together with a steady disappearance of specie notwithstanding an early embargo upon movements of coin which took effect in nearly all countries, comparatively early in the struggle although at slightly differing dates. The United States was of course the last to declare such an embargo, owing to the fact that it did not enter the war until the year 1917 was well advanced. Heavy borrowing at the banks in nearly all countries left these institutions at the close of the war in a very unliquid condition, their government paper holdings being "frozen" owing to inability to find buyers for them either at home or abroad due to the deterioration of public credit. But reliance upon foreign borrowing which was characteristic of practically all European countries that had found themselves able to get access to other markets, left all of them at the close of the war with tremendous external obligations which they were in no position to liquidate, owing to the fact that as a result of the conflict their productive power had been very greatly decreased. An unavoidable consequence of the drawing off of a large share of the population from economic occupation had been in all a corresponding curtailment of productive effort. The close of the war therefore found practically all European countries facing a highly complex problem in public finance—that of reducing the cost of their government to such an extent as to make it possible to pay the necessary sums from the proceeds of taxation thereby avoiding further borrowing, while at the same time enlarging their surplus export power sufficiently to provide a balance large enough to furnish the necessary funds abroad with which to pay interest and maturing obligations. This latter necessity was the more obvious because of the fact that for one reason or another it had been found necessary to "release" a great deal of gold as the war advanced thereby reducing the bank reserves and in some cases bringing the specie stock to so low an ebb that it was exceedingly doubtful whether any restoration of gold redemption could be brought about in the near future.

Results of Inflation Policy. The self-conscious inflation policy which was thus adopted by the belligerent governments was soon proven disastrous. It was not only exceedingly disturbing to business, but it also defeated the efforts of the governments which resorted to it as a fiscal expedient. Price levels rose rapidly and enormously in nearly all countries as may be seen from the table of index numbers below.

INDEX NUMBERS OF WHOLESALE PRICES (ALL COMMODITIES).[1]

	United States; Federal Reserve Board (90 quotations).[2]	Canada; Department of Labor (272 quotations).[4]	United Kingdom; Board of Trade (150 commodities).	France; Bulletin de la Statistique Générale (45 commodities).[3]	Italy; Prof. Bachi (38 commodities until 1920, 76 during 1921 and 100 thereafter).[2]	Germany; Statistisches Reichsamt (38 commodities).[2]	Sweden; Svensk Handelstidning (47 quotations).[4]
1913	100	100	100	100	100	100	[7] 100
1914	....	101	....	101	95	....	116
1919	206	217	....	357	364	....	330
1920	233	246	314	510	624	1,486	347
1921	145	182	202	345	578	1,911	211

	Christiania, Norway; Okonomisk Revue (93 commodities).[5]	Denmark; Finanstidende (33 commodities).[6]	Belgium; Department of Statistics (130 commodities).[13]	Switzerland; Dr. Lorenz (71 commodities).[11]	Holland; Central Bureau of Statistics (53 commodities).[12]	Australian Commonwealth; Bureau of Census and Statistics (92 commodities).[3]	Japan; Bank of Japan for Tokyo (56 commodities).[3]
1913	....	....	....	....	100	....	100
1914	[8] 115	[9] 100	[14] 100	100	105	[10] 100	96
1919	322	294	....	....	297	180	236
1920	377	382	....	....	282	218	259
1921	269	250	....	195	181	167	200

The effect of this advance in prices, brought about as it was by the practice of borrowing over-heavily at banks was to make commodities and services cost enormously more than they otherwise would. Particularly harmful results were experienced in the case of those countries which found it necessary to apply to foreign markets for munitions and supplies. Nearly all of the European countries had found themselves obliged at an early stage to buy heavily in the United States. Although the American price level had risen considerably even before our entering the war the advance had not been comparable to that which occurred at a later date, while such as it was it was directly ascribable to the heavy buying of the European governments and to the transfers of gold which they made to the United States in payment. As the foreign currency units deteriorated in value as measured by their power to command commodities at home, they deteriorated fully as much or more in their power to command American dollars in New York. The result was that when they were expended in the United States the amount of commodities realized as the result of the large sale of bonds either at home or in this country was relatively small, the short-term borrowing policy thus defeating itself by preventing the governments which resorted to it from getting the full value of taxation or loans which they had used as a means of obtaining money. This criticism, while theoretically sound, must of course be considered in the light of the fact that the industrial power of various countries had become so greatly reduced, and so large a proportion of the population had become actually engaged in war operations, that it may be questioned whether in some of the countries a larger application of the taxing power would have produced any result or whether perhaps it would have been endured by the population if added to the general suffering resulting from shortened food and other supplies, as well as from the actual fighting which had to be shared by practically the entire adult male population throughout the belligerent states. The war finance policy, however, left all budgets at the close tremendously inflated and left all debts far in excess of what they would have been had a non-inflation policy been pursued with corresponding doubt as to whether the burden of taxation necessary to pay the interest on these inflated obligations can actually be carried.

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[1] These figures are taken from the table published in the Bulletin of the Bureau of Labor Statistics, United States Department of Labor.
[2] Average for the month.
[3] End of month.
[4] Middle of month.
[5] End of year and end of month.
[6] First of month.
[7] July 1, 1913, to June 30, 1914 = 100.
[8] Dec. 31, 1913–June 30, 1914 = 100.
[9] July 1, 1912–June 30, 1914 = 100.
[10] July, 1914 = 100.
[11] Prices as of first of the month. 914 = 100.
[12] Based upon prices of 52 commodities during 1920, 53 during 1921. 1913 = 100.
[13] Average of last half of month.
[14] April, 1914 = 100.

Reliance on Direct Taxation. Prewar finances in many countries had relied largely upon indirect taxation. In the United States the Federal government was collecting in normal years the great bulk of its income from customs duties and internal revenue charges. During the early war years a small income from direct taxation was also obtained. Great Britain had long had the income tax in effect and it was producing substantially at the opening of the war. Nevertheless Great Britain also relied largely upon indirect taxes and the same was true of most countries. The war necessities changed all this and hostilities greatly increased the total burden of taxation and made it absolutely necessary, in order to get the required funds, to rely largely upon the proceeds of direct levying. Not only, therefore, was the total burden of taxation very greatly added to, but also the amount paid to governments as direct deductions from income not dependent upon purchase or the performance of specified acts was greatly enlarged. The effect of this change in method of taxation was undoubtedly to make the burden of the tax loads very much more obvious and to make it seem more serious than would have been true had it been collected entirely through indirect sources. Efforts to reduce budgets after the close of the war did not prove very successful and it was found in almost all cases that indirect taxation had been carried practically to the extreme of its productivity, while the income and excess profits taxes in this country which depended upon these sources of income predominantly had been raised to a point which was interfering with the growth of wealth. This latter consideration seemed to be of peculiar force in Great Britain and in the United States where during the early postwar years there was an obvious decline in the amount of saving due to the fact that taxpayers of large income really engaged in business found it a matter of relative indifference whether to increase their business expenses to a point which consumed what might otherwise have been additional net income or to pay the latter in large part to the government. With rates on incomes running as high as 60 to 70 per cent the inducement to saving beyond a specified limit was not strong. Hence most postwar fiscal policies which aimed at budgetary economy sought to bring about such economy by a reduction in the burden of direct taxation. One outgrowth of this movement was the adoption in November, 1921, of the Income Tax Revision Law in the United States which eliminated the excess profits tax, while in Great Britain the budget estimates for the year beginning April 1, 1922, abandoned the idea of further debt reduction during the year in question, excess profits taxes having already been repealed in 1921. The postwar taxation on the continent naturally followed a somewhat different course because of the fact that during the war so great a reluctance to further tax increases had been made manifest. The necessities of such countries as France, Germany, and Italy after the war naturally dictated the imposition of new rather than the withdrawal of old taxes because of the necessity of providing means which would carry the very heavy interest charges resulting from the borrowing policies of the war.

POSTWAR FINANCE

Postwar finance, both in the United States and in Europe, has had three principal objects—the reduction or abolition of the enormous taxation of the war period, the funding and consolidation of the debts created during war, and the reduction of government expenditures. Coincident with these it has been necessary to find a means of beginning the restoration of banking systems to a sound condition in order that foreign exchange rates might be placed upon a more stable basis and the international flow of trade and of investments be correspondingly facilitated. One principal obstacle to success in these undertakings has been the tangle of indebtedness existing between the various countries. Such indebtedness represented the aid extended by one country to another during the war, but it was early perceived that in the last analysis there was but one great creditor, the United States and one great debtor, Germany. It was recognized accordingly that the key to the restoration of a sound system of postwar finance was probably to be found in the introduction of a satisfactory system of reparations of payments which should enable the Allied belligerents to collect from Germany enough to enable them to offset the bulk of the losses to which they had been subjected and at the same time to settle with their external creditors. The Treaty of Versailles had made no definite disposition of these questions, leaving final settlement to the so-called Reparations Commission, which in March, 1920, announced a scheme of reparations payments whereby Germany's total obligation was fixed at 135,000,000,000 marks (prewar gold value). Elaborate details concerning the payment of this sum were provided and the bulk of the cash proceeds was assigned to France, Belgium, and Italy. The Germans, however, have since then failed to pay more than approximately enough to cover the cost of holding the occupied German territory which had been taken by the Allies as security for the liquidation of their claims. Accordingly, France and, in a much lesser degree, some of the other countries which have been relying upon the collection of German indemnities as a means of meeting their budget requirements have been unable (July, 1922) to obtain the funds necessary to settle the budget obligations they were incurring in the belief that they would be able to transfer the cost to the Germans. Hence, their budgets have failed to balance, and such reductions in taxation as have occurred have simply cut away the fundamental basis upon which a restoration of soundness would necessarily rest. Great Britain, which has not relied upon any considerable receipts from Germany, has been able gradually to restore her exporting power, despite some serious industrial obstacles such as the coal strike of 1921, and appears to be on the point of beginning the payment of interest upon her foreign obligations. The Continental countries, including France and Italy, show no indications of any such prospect to be realized in the early future and probably cannot be expected to balance their budget satisfactorily without borrowing at an early date. The pressure for reduction of the terrible tax load has been severe in all countries, but even in those where a cut might have been made, as in the United States, the recurrence of socialistic or semi-socialistic antagonism to wealth and capital has resulted in the retention of many war taxes as a peace expedient. The Republican party, elected in the autumn of 1920, largely on a platform of tax reform, adopted in October, 1921, a so-called tax revision measure which, however, has thus far cut the burden of taxation but slightly, although technically repealing the excess profits tax. Great Britain likewise has done away with the excess profits tax and similar action has been taken in other countries. Nevertheless, in all the problem of rebalancing, the budget has been seen to rest more and more upon the restoration of sound banking conditions.

Progress toward sound budgetary conditions was greatest in the United States and in England during 1920 and 1921. In the United States ordinary receipts up to November 12, for the fiscal year beginning July 1, 1921, exceeded ordinary disbursements by about $155,000,000. The British budgetary situation was less satisfactory, showing deficits in 1920–21, although it was steadily improving. It must be remembered, however, that the main factor in tax policy which accounts for this unfavorable balance was the reduction in receipts from the excess profits tax. Although certain funds were still coming in on this account from excess earnings during earlier years, there was a decrease during the first six months of 1922 of £82,336,000 from the corresponding period of the year before.

In most of the Continental countries the budget situation during 1921, on the contrary, showed no real improvement; in fact, the reverse, although in the case of France and Italy a certain amount of relative advance was scored. In other words, the total amount of outgo of these countries which had to be made, not from the proceeds of taxation, but either from short-term bank borrowing or the issuing of currency, increased rather than diminished. Figures for Italian finances for the fiscal years ending June, 1921, and June, 1922, were still in the form of estimates, the actual accounts not being available at the latter date. According to the latest estimates, however, it appeared that the deficit for the year would be only about one-half that for the year ending in June, 1921. In other words, the estimated deficit for 1920–21 amounted to 10,300,000,000 lire, while the estimated deficit for 1921–22 worked out at 5,000,000,000 lire. The French government contemplated an expenditure for 1921 amounting to 42,412,000,000 francs, as contrasted with receipts of 23,312,000,000 francs, thus leaving a deficit of about 19,000,000,000 francs to be procured by the flotation of loans. Of this deficit, about 16,000,000,000 francs was regarded as eventually recoverable from Germany under the terms of the peace treaty. Of the ordinary receipts, 14,558,000,000 francs were expected from indirect taxes and monopolies. During the first half of 1921 the total public debt of France rose from 245,000,000,000 francs to 264,000,000,000 francs, calculating in both instances the foreign debt at par. This figure does not include loans floated by the cities and industries in the devastated regions, although the government is responsible for their interest and repayment. In the case of Germany close estimates of the total amount of government expenditures for 1922 were not available.

There has been a prevailing belief for a long time past that the principal element in the existing fiscal difficulties of many countries is to be found in their great outlay for war. This statement is true in broad terms, but requires to be qualified and limited in its application. In some countries, such as the United States, the outlay for war, while a very large part of the total outlay, is in large measure an expense which serves to carry the cost of past wars in the form of interest on public debt. While naval and military expenditure is large in such countries, it is a relatively moderate part of the entire budget. In other countries, like France, the current cost of military support still constitutes a very important fraction of the budgetary outgo. It has, therefore, been thought worth while to compile statements designed to show the comparative situation of the budget in several of the principal countries, with a view to ascertaining approximately how each one of them stands in this matter of expenditure for national defense, especially as compared with the prewar years.

Compared with 1913, the last prewar year, the amounts of money expended for national defense by the governments of France, Italy, and Germany show enormous expansion, but it should be remembered that the purchasing power of the currencies of these countries has undergone varying degrees of depreciation, and that the larger amounts for the more recent years, when reduced to 1913 monetary equivalents, will not show the same degree of expansion as is indicated in the table. During the war years the proportion of the total expenditures made for war purposes was in excess of 80 per cent in all three of these countries. In 1920 the proportion had declined to 60 per cent in Germany, to about 50 per cent in France, and, according to

GREAT BRITAIN.

(In thousands of pounds sterling.)

	(a) Net revenues.	(b) Net expenditures.	(c) Public debt charges.	Per cent (c) to (b)	(d) Expenditures for national defence.	Per cent (d) to (b).
1904–05	137,590	136,176	27,000	19.8	66,055	48.5
1912–13	165,778	165,598	24,500	14.8	72,436	43.7
1916–17	546,974	2,171,659	127,250	5.9	1,302,603	60.0
1918–19	862,625	2,552,905	269,965	10.6	1,701,545	66.7
1920–21	1,376,485	1,145,928	349,599	30.5	292,228	25.5
FRANCE. (In thousands of francs.)						
1905	3,502,034	3,453,634	1,205,124	34.9	1,143,820	33.1
1913	4,558,044	4,718,462	1,284,079	27.2	2,070,530	43.9
1917	5,575,845	[1] 41,679,600	4,863,686	11.7	34,065,809	81.7
1919	10,161,214	[1] 49,026,587	7,986,823	16.3	35,811,390	73.0
1920	17,760,789	[1] 52,183,217	11,833,174	22.7	26,432,545	50.7
ITALY. (In thousands of lire.)						
1905	1,764,220	1,701,430	680,050	37.6	419,200	24.6
1913	2,385,130	3,289,010	598,220	18.2	1,666,660	50.7
1917	5,170,430	16,971,000	1,227,310	7.2	14,310,680	84.3
1919	9,372,360	32,150,100	2,705,200	8.4	26,974,420	83.9
GERMANY. (In thousands of marks.)						
1905	1,110,451	1,310,290	112,047	8.6	1,052,288	80.3
1913	1,957,380	2,024,523	231,176	11.4	1,582,290	78.2
1917	2,122,304	27,821,047	2,616,793	9.4	24,920,907	89.6
1919	6,348,460	46,966,460	5,914,204	12.6	40,179,143	85.5
1920	14,379,439	61,470,870	8,922,692	14.5	37,033,588	60.2

[1] Total expenditures.

preliminary figures not included in the table, to less than 40 per cent in Italy; in Great Britain and the United States the proportion for the fiscal year 1921 was 26 and 24 per cent, respectively. Nevertheless, the financial burden upon taxpayers of these countries due to military expenditures was much heavier at present than before the war, since national production and income had suffered severely, and fiscal requirements for rehabilitation and reconstruction were an additional drain on national resources and income. While the proportion of total expenditures devoted to military purposes was, according to the fiscal returns, smaller in some countries in 1922 than before the war, these expenditures undoubtedly constituted a larger proportion of the diminished national incomes and were, therefore, a more crushing load on the financially weakened countries of Europe. The following table exhibits the per capita burden of taxation in some of the chief countries of the world:

PER CAPITA TAXATION

On Basis of 1920–21

United States	$53.71
United Kingdom	105.47
Australia	28.16
Canada	35.05
Germany	31.59
France	44.51
Italy	22.80
Japan	7.38

The question whether some adjustment or alleviation of this tremendous burden can be devised has occupied the attention of statesmen since the close of the war but has confirmed most in the belief that heavy direct taxes will continue the chief reliance of most countries for a long time to come.

Government Activity in Business. The participation of the government in business which before the war had produced a very considerable element in the revenue system of some countries (e.g., France, Germany, Austria and others), received a considerable extension in consequence of the war and of necessities attendant thereon, but the success obtained has been so slender as to produce a reaction of opinion among those who in former years regarded public activity of this kind as a probable source of future increase in revenue yield. Railroad operation which was undertaken on an extensive scale both by Great Britain and the United States has proved an actual source of loss and has been discontinued in both countries. The operation of ocean-going ships has been equally disappointing and state manufacture of various kinds of commodities has turned out even more unsuccessfully than during prewar years. Instead of assuming an increasingly important position in budgets, revenue derived from industrial and business occupations has not only come to form a smaller and smaller proportion of total income; but, as just stated, it has been obtained under circumstances of such difficulty as to make it clear that it must be regarded as an inadequate reliance for the future.

Tariffs and Internal Revenue. Prior to the opening of the war it seemed probable that tariff duties had reached approximately their ultimate position of productiveness. Many years of experiment with the protective tariff in the United States had failed to bring about a total revenue larger than about $350,000,000 per annum. In Europe the productiveness of tariffs had fallen as rates increased, expense of administration advancing very rapidly. The war had a peculiar effect upon customs duties in all countries. It naturally diminished the amount of private international trade while it greatly increased the amount of such trade undertaken for the benefit of governments. But this latter type of trade was in general free of customs duties. Except for sporadic and temporary yields of unusual size in a few countries due to sudden changes in the movement of commodities as the result of war, tariff duties were an unimportant source of income especially when compared with the enormous revenue derived from direct taxation. Since the war, this disproportion has in some measure decreased owing to the moderate reduction which has taken place in some countries in the amount of direct taxes. At the same time, there has been a tendency on the part of tariff duties to increase in rate and to become more numerous partly as a result of the particularism of newly erected states in different parts of the world. Protectionism has also assumed a new activity in some countries, notably the United States, with the result that the yield of the tariff has tended to be impaired nearly everywhere. As for internal revenue duties such as the taxes on tobacco they were already near maximum productivity in many countries before the outbreak of the war and the war taxes, in some cases, at least, pushed them beyond the point of maximum productiveness and into the field of partial prohibition. The war added very greatly to the number of taxable objects and in that way increased the yield of internal revenue taxation, but these "luxury taxes" or "consumption taxes" proved so expensive and unpopular from the standpoint of the consumer that soon after the war was over effort was made to reduce them and substantial cuts in their number occurred, the United States eventually abolishing luxury taxes entirely (on and after January 1, 1922). This movement against consumption taxes tended to leave the prewar excises on such articles as tobaccos and liquors as the chief revenue producers. In the United States the prohibition amendment and legislation under it, however, speedily eliminated alcholic liquors as a foremost source of income. Tobacco has continued to yield an increasing revenue. It does not appear, however, that excise taxes will in any near future play the important part that was allotted to them in the prewar budgetary arrangements.

State and Local Taxation. Expenditures were enlarged as a result of war conditions not only for national governments, but also for local governmental units of every kind. This was the outcome in part of higher prices resulting from the inflation policy of various governments which not only increased the cost of commodities to administrative organizations, but also necessitated rapid advances in rates of pay. Local governments for the most part met these requirements by increasing the rates of taxation on taxable objects already chosen, and by borrowing so far as necessary. State governments, however, in a number of instances, found it desirable to resort to the income tax or in those cases where they already were employing this method of raising revenue, they advanced tax rates on incomes and in other instances added surtaxes. Real estate levies were very generally enlarged throughout the United States. In European countries local governments which possessed tax systems of their own generally followed the plan of intensifying prewar rates on existing objects, but without endeavoring to introduce any decidedly novel system of tax contribution. Public debts, however, had a very rapid growth locally as well as nationally and this growth was accelerated by the fact that the practice of exempting local securities from taxation prevailed so widely, especially in the United States, thereby enabling local governments to borrow cheaply. During the business reaction of 1920, the demand for employment designed to take care of individuals who were out of work tended to a great expansion of public borrowing in order to provide funds for the conduct of such public works. On the other hand urgent demand for the disbursement of large bonuses to returned soldiers imposed upon not a few State governments burdens heavier than they felt warranted in putting into taxable form especially in those cases where the bonus was paid once in a lump sum. Hence a further enlargement of local loans.

NEW UNITED STATES BUDGET SYSTEM

The President introduced the budget under the new budget system with a message to Congress, Dec. 5, 1921. It was the result of ten years of active work, beginning with President Taft's attempt to provide for executive control over national expenditures. The law approved June 10 providing for a national budget system and an independent audit of government accounts was hastened by the confused condition of the national finances resulting from the war. The new system, however, was simply a step toward a genuine executive budget system, and, if it were to have that result, radical changes must still be made, but, according to some, they could not be introduced without an amendment to the constitution. The essential element of the budget system is that income and expenses are presented as a whole and considered in relation to each other. For purposes of comparison similar statements running back for a term of years must be considered. In the United States where the transactions of the government are complicated and very numerous this information had never been fully obtained. Appropriations in Congress being in the hands of many separate committees in each House and being without executive control, there were practically no means of providing the information required under a genuine budget system. The machinery outlined in the following paragraphs, including the Bureau of the Budget, an independent audit department under a controller-general and a general accounting office, was established for the purpose of securing the necessary data. Before the close of 1921 the Bureau of the Budget had established a large number of coördinating agencies, including the following:

(1) A Federal Purchasing Board, on which the chief purchasing officer of each department serves with a chief coördinator as chairman named by the President;

(2) A Federal Liquidation Board, coördinating sales under a unified plan of large surplus stocks of the various departments of the government;

(3) A Corps Area Organization, corresponding to the nine Army Corps Areas, to provide for interdepartmental transfers and exchange of supplies in connection with either purchases or sales and operating together with the Purchasing

and Liquidation Boards at Washington to handle properly the entire purchase and supply situation;

(4) A Surveyor General of Real Estate, to handle property owned by the United States and leases of property required for government business and to assign and reassign spaces to the various departments, bureaus, or offices;

(5) A Federal Motor Transportation Agent, to coördinate motor transportation;

(6) A Federal Traffic Board, to coördinate and classify articles shipped by the government and the business involved in the government's annual transportation bill;

(7) A Federal Board of Hospitalization, which provided for the feeding and housing of about 500,000 persons;

(8) A Federal Specification Board, for the standardization of specifications; and

(9) An Interdepartmental Board of Contracts and Adjustments.

Bibliography. The principal sources of information of war finance are still the financial reports of the various countries. For the United States the reports of the Secretary of the Treasury and the annual reports of the Federal Reserve Board give the most complete and authentic information. The League of Nations has also published, preliminary to the international financial conference at Paris, a series of documents which deal at great length with public finances during the war. Volume IV is perhaps the most useful of these publications. The following works are also of service in this same connection: Bogart, *Direct and Indirect Costs of the Great World War;* Anderson, *Effects of the War on Money, Credit, and Banking in France and the United States;* Gottlieb, L. R., *Financial Status of the Belligerents and Post-War Finance* (a series of four monographs issued by the Bankers Statistics Corporation, New York, 1920–21); Benson, *State Credit and Banking during the War and After;* Seligman, *Currency Inflation and Public Debts* (Equitable Trust Company, New York, 1922); Hollander, *War Borrowing.*

FIN'BACK, or **FIN'NER.** A whalebone whale of the genus *Balænoptera*, so called because of the marked development of the dorsal fin, which in most whales is either small or wanting. They are the largest of living animals, ranging from 30 feet up to the colossal dimensions of the "sulphur bottom" of the Pacific, which is sometimes more than 100 feet in length. They yield little oil, and the whalebone is of poor quality, so that they are not much sought after. The most common whale on the coast of the eastern United States is a finback, or razorback (*Balænoptera musculus*), which reaches a length of about 70 feet. Consult True, *Whalebone Whales of the Western North Atlantic* (Washington, 1904). See Plate of WHALES.

FINCH (AS. *finc*, Ger. *Fink;* connected with Welsh *pinc*, chaffinch, Russ. *pienka*, hedge sparrow). The popular name of a great number of species of small birds of the family Fringillidæ (q.v.). Many of them have great powers of song and are called by bird fanciers "hard-billed song birds," in contradistinction to the Old World warblers (Sylviidæ), or "soft billed song birds." The name is sometimes used as equivalent to Fringillidæ; but the limits of its popular use are ill defined, and some birds are known as finches and also as linnets, or as grosbeaks, etc. The word "finch" often forms part of the popular name of birds of this family, as bullfinch, chaffinch, hawfinch, etc., and is almost always used with some prefix or qualifying adjective. When used as a general term applicable to the whole family, it includes those nine-primaried oscines (q.v.), with more or less conirostral bill, which have the corners of the mouth more or less sharply drawn down. The shape of the bill varies greatly; sometimes it is short and thick, sometimes comparatively slender and elongated, but it is almost always adapted to crushing seeds. Finches feed mostly on seeds and buds, but some species are more or less insectivorous. The family is a very large one, including over 1000 species, divided into about 140 genera, and found in all parts of the world except Australia. They are most abundant in the Northern Hemisphere and especially in America; 200 species and subspecies occur in the United States and Canada.

Finches are nearly allied to the tanagers, weaver birds, and American starlings and blackbirds, and it is difficult to draw any hard and fast lines between these families. The birds called buntings, sparrows, grosbeaks, linnets, redpolls, longspurs, and snowbirds are all finches, but will be treated of under these separate heads. In the United States the name "finch" is not in very common use, though there are some species with which it is constantly associated. The purple finch (*Carpodacus purpureus*) is a good songster and is often called the linnet. The female is plain brown, streaked with black, but the male is suffused with rich rose red, especially deep on the head, so that he is a handsome bird. This finch and very closely allied species occur over the whole of the United States. The rosy finches, of which there are some half-dozen species, constituting the genus *Leucosticte*, are characteristic of the Rocky Mountain region, extending north and westward. They are 7 inches or less in length, brownish or grayish in color, the males suffused with rosy red posteriorly. The grass finch (*Poœcetes gramineus*) is more properly a sparrow, and is usually called vesper sparrow or bay-winged bunting. Other well-known finches of the United States are the summer finches (*Peucœa*), of which half a dozen species are found in the Southern and Western States; the painted finches (*Passerina*), of which the indigo bird (q.v.) is a good example; the pinefinches, or siskins (q.v.); and finally, the goldfinches (q.v.). See Plates of CAGE BIRDS, EGGS OF SONG BIRDS, and SPARROWS.

Consult Ridgway, *Birds of North and Middle America*, part i (Washington, 1901).

FINCH, ANNE. See WINCHELSEA, COUNTESS OF.

FINCH, DANIEL (1647–1730), second EARL OF NOTTINGHAM and sixth EARL OF WINCHELSEA. An English statesman. He was educated at Westminster School, Christ Church College, Oxford, and the Inner Temple, entered Parliament in 1679, became a Privy Councilor in 1680, and was First Lord of the Admiralty from 1680 to 1684. In 1682 he was called by his father's death to the House of Lords. After the Revolution he remained, in theory, loyal to the Stuarts, but distinguished between the King de facto and the King de jure and gave in his adherence to the new régime. He was one of the Secretaries of State from 1688 to 1693 and again from 1702 to 1704. He became the leader of the church party and introduced the Toleration Act of 1689 in the House of Lords. He was a favorite of Queen Mary and enjoyed to some extent the confidence of Queen Anne until he urged that the Electress Sophia be invited to live in England. From 1714 to 1716 he was President of George I's Council. In 1721 he wrote *An Answer to Mr. Whiston's Letter Concerning the Eternity of the Son of God.* He is the subject of Dean Swift's famous ballad, "An Orator Dismal of Nottinghamshire," and he was nicknamed Don Dismal and Don Diego.

FINCH, Francis Miles (1827–1907). An American poet and jurist. He was born at Ithaca, N. Y., and graduated at Yale in 1849. He studied law and began practice at Ithaca. He was a collector of internal revenue during Grant's first administration, and in May, 1880, was appointed a judge of the New York Court of Appeals, to fill a vacancy. In the fall of 1881 he was elected to the same bench for a full term of 14 years. He took a prominent part in the organization of Cornell University, was a member and secretary of the board of trustees for many years, and in 1892 became dean of the law school. His literary work consists largely of poems, among the best known of which are "The Blue and the Gray" (1867) and "Nathan Hale" (1853). A volume of his verse was published in 1909 under the title *The Blue and the Gray and Other Verses.*

FINCH, Heneage. See Nottingham.

FINCH, William Albert (1855–1912). An American lawyer and law writer. He was born at Newark, N. J., and, graduating from Cornell University in 1880, was admitted to the bar in the same year. Until 1891 he practiced at Ithaca, N. Y., and from then until his death he was professor of law at Cornell. He became known as an authority on the law of real property, and he published *Finch's Selected Cases on the Law of Property and Land* and *The Law of Property and Land—A Syllabus* (1900).

FINCH'LEY. A municipality of Middlesex, England, about 4 miles north of London City (Map: London, C 6). The town owns its electric-lighting plant, a fine recreation ground, 16½ acres in extent, and a group of workmen's dwellings. Pop., 1901, 23,699; 1911, 39,419. Finchley common was a favorite resort of Dick Turpin, Jack Sheppard, and other celebrated highwaymen, who made it a dangerous neighborhood as late as the close of the eighteenth century.

FINCK, fiŋk, Friedrich August von (1718–66). A Prussian general, born at Strelitz. He served successively in the Austrian (1735), Russian, and (after 1743) Prussian armies and was appointed adjutant major to Frederick the Great. In 1759 he was promoted lieutenant general. Detailed by Frederick the Great to assist Prince Henry in the defense of Saxony, he compelled Field Marshal Daun to retreat, but expostulated with the King when ordered to pursue. He followed Daun as far as Maxen, where he was attacked by an overwhelming body (42,000) and compelled, after a brave defense lasting two days, to surrender his entire force (11,000). Although personally blameless, he was condemned by the military tribunal to be expelled from the army and to be imprisoned in a fortress for two years. In 1764 he entered the service of the King of Denmark. He died at Copenhagen. Consult Mollwo, *Die Kapitulation von Maxen* (Marburg, 1893).

FINCK, Henry Theophilus (1854–1926). An American musical critic, born at Bethel, Mo. A few years after his birth the family removed to Portland, Ore. There he studied piano and violoncello, and taught himself Latin and Greek so thoroughly that he was able, in 1872, to enter the sophomore class at Harvard, where he devoted himself chiefly to philosophy, the classics, and music, the last under Prof. John K. Paine. In 1876 he attended the Bayreuth Festival, of which he wrote accounts for newspapers and magazines. A subsequent fellowship from Harvard enabled him to spend three years in study in Berlin, Heidelberg, and Vienna. In 1881 he became musical editor of the New York *Evening Post* and entered upon his long propaganda for Wagner's music, becoming the leading American advocate of that composer's theories. His writings include: *Romantic Love and Personal Beauty* (1887); *Chopin, and Other Musical Essays* (1889); *Pacific Coast Scenic Tour* (1890); *Spain and Morocco* (1890); *Wagner and his Works* (1891); *Lotos Time in Japan* (1898); *Primitive Love and Love Stories* (1899); *Pictorial Wagner* (1899); *Anton Seidl* (1899); *Songs and Song Writers* (1900); *Edvard Grieg* (1905); *Massenet and his Operas* (1910).

FINCKENSTEIN, fiŋk'en-stīn, Karl Wilhelm, Count Finck von (1714–1800). A Prussian statesman. He was a son of Count Albrecht Konrad Finckenstein, field marshal of Prussia and preceptor to the Crown Prince, afterward Frederick the Great. He was educated at Geneva and was Ambassador to Stockholm from 1735 until 1740. Frederick the Great, upon his accession to the throne, sent him as Ambassador to Denmark (1740–42), England (1742–44), and Stockholm (1744–46). He was Ambassador to Russia from 1747 to 1749 and upon his return was appointed member of the cabinet, becoming one of the chief advisers of Frederick, who corresponded with him with great freedom and frankness throughout the Seven Years' War and sent to him the celebrated secret instructions dated Jan. 10, 1757. Until 1763 he conducted the foreign affairs of the kingdom and in June, 1799, celebrated his fiftieth anniversary as Minister.

FIN DE SIÈCLE, fäɴ de sē-ā'kl' (Fr., end of the century). A phrase that became popular in Paris in 1889 and then made its way into the vocabulary of other countries. It was intended to signify that an idea, an object, or what not, was quite up to the latest date and thoroughly characteristic of the hour. When the twentieth century began, the phrase was dropped, and *vingtième siècle* was used in its stead, though this latter phrase had not the vogue of the former.

FIND'ING (from *find*, AS. *findan*, Icel. *finna*, OHG. *findan*, Ger. *finden*, Goth. *finþan*, to find). 1. A qualified source of title to goods and chattels at common law. It is true the loser is not divested of his title to his goods when they pass by finding into the hands of another: he may reclaim them until his right becomes barred by the statute of limitations; but the finder acquires what is known as a "special property" in them, which is available to him against all the world except the true owner. He may make no use or disposition of them except such as is necessary to preserve them, but he may by appropriate action recover them from any one but the owner who interferes with his possession, even from a subsequent finder. It has been decided that if the property had not been designedly abandoned, and the finder knew who the owner was or knew that he could have discovered him, he was guilty of larceny in keeping and appropriating the articles to his own use. In the absence of statute the finder has no lien on the property for the expenses incurred by him in caring for it or in seeking to discover the owner, but in some States statutes have been enacted giving him such a lien. As between the owner of premises in which lost or secreted chattels are discovered and the finder, the former has usually the better title. But if the articles are found in a shop, hotel, or other public place, the finder is entitled to them as against the possessor of such place. If goods are improperly withheld by the finder, the common-law remedy of the rightful owner is the action of *detinue* (q.v.); where the finder uses them as his own or disposes of them, he is liable to an action of *trover* (q.v.). In many of the United States statutory remedies have been provided not differing essentially from the common-law procedure. See Derelict.

2. The technical designation of the formal statement of the conclusion reached by the tribunal trying an issue of fact. It is called a general finding when it disposes of the entire case. If it is a statement of particular facts, to which the law is thereafter to be applied by the court, it is known as a special finding. The refusal of a court or referee to make a finding concerning a material fact with respect to which evidence has been given constitutes an error of law, entitling the injured party to relief from an appellate court. The finding of a court, referee, or jury when the evidence is conflicting is rarely disturbed on appeal; but a finding without any evidence to support it or one clearly against the weight of evidence will be set aside. In the United States the term "findings" is also usually employed to describe the conclusions of law, as well as those of fact, announced by a referee, commissioner to hear and determine, or other subordinate judicial officer to whom issues of law have been submitted for determination. See Appeal; Court; Jury; Reference, Referee, and authorities cited.

FINDLATER, fĭn′la-tẽr, Andrew (1810–85). An English encyclopædist, born at Aberdour, Aberdeenshire, and educated at the University of Aberdeen. He began his connection with the publishing firm of Messrs. Chambers of Edinburgh in 1853, and subsequently became editor of their *Encyclopædia*, to which he was also a contributor. This work, completed in 1868, was issued in a revised edition under his editorship in 1874. Among the scientific manuals prepared by him for the firm, the handbook on philology is regarded as especially meritorious.

FIND′LAY. A city and the county seat of Hancock Co., Ohio, 45 miles by rail south by west of Toledo, on the Blanchard River, and on the Toledo and Ohio Central, the Cincinnati, Hamilton, and Dayton, the Cleveland, Cincinnati, Chicago, and St. Louis, the Lake Erie and Western, the Lake Shore Electric, and the Western Ohio railroads (Map: Ohio, C 3). It is situated in the oil and natural gas fields of Ohio and is surrounded by a rich agricultural country. In the vicinity are beds of clay, building stone, and lime, and deposits of sand and gravel. The manufacturing establishments are numerous and include brick and tile works, machine shops and foundries, boiler, bridge, and target works, sugar and oil refineries, potteries, lime kilns, and manufactories of automobiles, traction ditchers, electric insulators, gloves, shoes, furniture, carriages, etc. Findlay College (Church of God), opened in 1886, is situated here, and the city contains a public library, city hospital, detention, orphan, and Elks homes, and several fine parks. Settled in 1813, Findlay was first incorporated in 1837. The government, under a charter of 1902, is vested in a mayor, chosen biennially, a city council, and members of public safety and service, the two latter being appointed by the mayor. The city solicitor, auditor, treasurer, and board of education are chosen by popular vote. The water works are owned and operated by the municipality. Pop., 1900, 17,613; 1910, 14,858; 1920, 17,021.

FINDLAY, George Gillanders (1849–). An English Wesleyan scholar and educator, born at Welshpool, Wales. He graduated from Wesley College, Sheffield, the Richmond Theological Institution, and London University (1868). From 1870 to 1874 he was assistant tutor, and after 1881 tutor of New Testament exegesis and classics, at Headingly Theological Institution. During the interim (1874–1881) he had been classical tutor in the Richmond Theological Institution. He is author of volumes on various Epistles of Paul, in *The Expositor's Bible, The Expositor's Greek Testament*, and *The Cambridge Greek Testament* (1888, 1892); *The Epistles of the Apostle Paul: Their Origin and Contents* (1892); *The Church of Christ in the New Testament* (1893); *Christian Doctrine and Morals* (1894); *The Books of the Prophets and their Historical Succession* (3 vols., 1896–1907); *The Things Above* (1902); *Fellowship in the Life Eternal; An Exposition of the Epistles of St. John* (1909); *Life of William F. Moulton*, the Methodist Scholar (1910). He also contributed largely to biblical encyclopædias and theological journals.

FINDLAY, John Ritchie (1824–98). A Scottish newspaper proprietor and philanthropist, born at Arbroath, Scotland, and educated at Edinburgh University. He entered the business office of the *Scotsman* in 1842, rising until in 1868 he became a partner with his great-uncle, John Ritchie, who when he died in 1870 left most of his interest in the paper to Findlay. Under the latter's control the prestige and circulation of the *Scotsman* and the wealth of the owner were greatly increased. Much of this money Findlay spent during his lifetime in public benefactions, of which the most notable was the Scottish National Portrait Gallery in Edinburgh, which cost £70,000 and was opened in 1889.

FINE (OF., Fr. *fin*, from Lat. *finis*, end, supplementary payment, fine). A form of conveyance of lands at common law through the medium of a fictitious suit, employed in cases where an ordinary conveyance would not have the effect of vesting the full estate intended to be conveyed. It was for centuries the favorite method of "barring an entail," i.e., of enabling a tenant in tail to transform his limited fee into an absolute fee simple, and thus bar the heirs of his body and the reversioner or remainderman of his interest in the estate. See De Donis; Fee Tail.

A fine is defined by Coke as "an amicable composition and final agreement by leave and license of the King or his justiciaries"; and it was called a fine because it put a termination (*finis*) to all litigation between the parties, and those claiming through them, in regard to all matters touching the suit. The proceedings in a fine were shortly as follows: The party to whom the land was to be conveyed commenced a fictitious suit against the vendor. But the case was no sooner in court than the plaintiff asked leave to agree or settle with the defendant. This leave having been obtained, a covenant was entered into whereby the vendor or defendant, called the *cognizor*, recognized the right of the plaintiff, called the *cognizee*, to the lands, of which he admitted that the plaintiff was wrongfully kept from the possession. These proceedings, which at first were real, were afterward adopted universally without having a shadow of foundation in fact. The solemn farce having been completed, a *note* of the fine, being an abstract of the covenant, the names of the parties, and the parcels of the land, was entered on the rolls of the court; and the business was concluded by what was called the *foot* of the fine, setting forth the parties, the time and place of agreement, and before whom the fine was levied. The whole was embodied in indentures commencing *hæc est finalis concordia*. It was necessary that a fine should be levied openly in the Court of Common Pleas, or before the Chief Justice of that court, or before two or more commissioners, duly appointed. In order that a fine should have full effect, it was required to be levied with *proclamation*, i.e., open proclamation of the transaction in court.

A fine so levied cut off the right even of strangers who failed to assert their claim during the period allowed by law; hence an estate was said to be barred by fine and nonclaim. A fine levied by a married woman had the effect of cutting off all right she might have in the lands and was the only mode by which a married woman could convey her lands or her dower right in her husband's lands. Like the feoffment and the common recovery (q.v.), a fine was known as a tortious conveyance; i.e., it had the extraordinary operation of conveying whatever estate it purported to convey, irrespective of whether the vendor was seised of the estate conveyed or had any right to transfer it. The effect of such a tortious conveyance was to vest a defeasible title in the vendee, leaving the person entitled to the possession to pursue his remedy by entry or appropriate action.

The practice of conveying lands by fine, as well as the process of common recovery, was abolished by the Fines and Recoveries Act, 3 and 4 Wm. IV, c. 74. Both of these modes of conveyance were in use in the Colonial period of American history, but have become obsolete or have been abolished by statute. The fine was recognized and confirmed by legislative act in New York and was not done away with until 1830. See Conveyance.

FINE. In criminal law, a pecuniary mulct or punishment imposed by a competent court upon an offender convicted of a crime or misdemeanor. The term came into use in England during the reign of Edward I, when it became common for a court to sentence a culprit to a short term of imprisonment and then to allow him to "make fine," i.e., to make an end (*finem facere*) to his imprisonment by paying into court a certain sum of money. At the outset this was considered a sort of bargain to end his imprisonment, and not as an infliction of a pecuniary penalty, as the judges desired to avoid the possibility of the practice being confused with that of amercement (q.v.), which must be fixed by the assessment of the offender's peers.

The practice of allowing a culprit convicted of a trivial offense thus to have his option of fine or imprisonment still prevails in our criminal jurisprudence. This is true especially in the punishment of misdemeanors, the penal statutes usually prescribing as the punishment a short term of imprisonment or a moderate fine or both, in the discretion of the court. In the less aggravated cases the magistrates usually impose the fine only, or give the misdemeanant the option of fine or imprisonment; but where a fine is imposed, if the culprit is unable to pay, he is remanded to prison, and a certain amount of his fine is considered as discharged for each day of confinement. For example, in New York if a magistrate imposes a fine of $10, on default of payment the culprit is confined in a penal institution for 10 days, his fine being considered as reduced $1 each day. It is provided in the United States Constitution (Eighth Amendment) that "excessive bail shall not be required nor excessive fines imposed." This does not set any definite limitation on the power of Congress to impose such pecuniary penalties as may seem expedient, but it affords grounds for attacking the constitutionality of a statute which seems oppressive in this particular and thus makes the legislative act subject to review by the courts. Most of the States have inserted similar provisions in their constitutions. See Amercement; Forfeiture; Penalty.

FINE, Henry Burchard (1858–1928). An American university dean and mathematician. He was born at Chambersburg, Pa., and was educated at Princeton (A.B., 1880) and Leipzig (Ph.D., 1885) universities. At the former institution he was assistant professor from 1885 to 1890, when he became professor, and he was also dean of the faculty in 1903–12 and dean of the department of science after 1911. He was president of the American Mathematical Society in 1911–12. Besides papers on mathematical subjects, he is author of *Euclid's Elements* (1891); *The Number System of Algebra* (1891; 2d ed., 1903); *A College Algebra* 1905); *Coördinate Geometry,* with Henry Dallas Thompson (1909).

FINE, fĕn, or **FINÉ,** fĕnā′, Oronce. See Orontius Fineus.

FINE-EAR. A servant of Fortunio, in the fairy tale *Fortunio,* who could hear the grass or a sheep's wool grow.

FINET'TA. A fairy tale, by the Comtesse d'Aulnoy (1682). It is only a slightly altered version of *Cinderella.*

FINGAL, fiŋ′gal. The name of the hero in Macpherson's *Poems of Ossian.* (See Macpherson, James.) It represents an original Gaelic *Fionn Gaidheal* (Fin the Gael) and appeared as *Fionnghael* in the 1763 edition of *Temora.* But in the collected edition of Macpherson's Gaelic texts (1807) the spelling is regularly *Fionnghal* In all genuine Ossianic literature the name of the leader is simply *Fionn* (earlier *Finn*), but this regular form occurs very rarely in Macpherson. Consult Macpherson, *Poems of Ossian,* with an historical and critical introduction by J. Eyre-Todd (London, 1906).

FINGAL. Another, but unauthorized, name for the Gaelic hero Fionn Maccumhail (q.v.).

FINGAL'S CAVE. See Staffa.

FINGER. See HAND.

FINGER-AND-TOE DISEASE. See CLUB-ROOT.

FINGER BOARD (AS. *finger*, Icel. *fingr*, Goth. *figgrs*, OHG. *fingar*, Ger. *Finger*, finger + *board*). In stringed musical instruments, the thin strip of wood glued upon the neck, above which the strings are stretched and on which the player presses his finger when shortening the strings. At its lower end the finger board projects over the sounding board of all instruments played with the bow, but in other varieties, as in the guitar, it is glued down on both neck and sounding board. In some stringed instruments plucked with the fingers the finger board is divided by frets to enable the player more readily to find the correct pitch. See KEYBOARD.

FIN'GERING. In music, the method of applying the fingers to the keys, holes, strings, etc., of musical instruments. The simplest fingering is upon the brass wind instruments, whose keys are so few that they can be manipulated by one hand without change of position. The wood-wind instruments come next in order of difficulty, various functions being assigned to each finger, and sometimes the same key being pressed by different fingers. For the fingering of stringed instruments, such as the violin, see POSITION. The most complicated fingering, however, is on instruments having keyboards. The method of notation for fingering used at present on the pianoforte in which the thumb is marked 1, and the fingers 2, 3, 4, 5, is the outcome of a long series of experiments, prominent among the reformers being Bach, Liszt, Tausig, and Bülow. The English system, in which the thumb was marked x and the fingers 1, 2, 3, 4, has practically been abandoned. Consult: Whittingham, *Companion to all Instruction Books for Keyed Instruments* (London); Ch. Neate, *An Essay on Fingering* (ib., 1855); O. Klauwell, *Der Fingersatz des Klavierspiels* (Leipzig, 1885). See also articles on the various instruments.

FINGER PRINTS. The patterns composed by the papillary ridges on the palms of the hands and soles of the feet possess two characteristics that adapt them peculiarly to the requirements of personal identification—persistence in general character through life, and wide variation as between individuals. These characteristics are especially marked in the case of the patterns of the fingers. Recognition of this fact has led to a widespread advocacy among men of science of the practice of obtaining and preserving impressions of the finger patterns of persons whom it may later be necessary to identify with certainty. Among the proposed applications of the finger print the one of greatest general interest is its use as a means of criminal identification. Low as are the chances of error under the Bertillon system (q.v.), they are not altogether wanting. By supplementing the Bertillon measurements with records of finger prints identification can be made certain. The use of finger prints as a means of identification of soldiers has been proposed and in some cases has been practiced. Another application of importance is as a substitute for the signature on legal documents or as a supplement to such signature. The use of the finger print renders forgery impossible; furthermore, it offers a means for securing authentic evidence of the personal coöperation of an illiterate in the execution of documents in his name. A number of financial institutions, both in the United States and in other countries, have experimented with the use of finger prints with satisfactory results, although without gains sufficiently striking to secure the wide acceptance of the plan.

The most spectacular application of finger-print methods is to the detection of crime. In the course of the commission of a crime the criminal may accidentally leave an imprint of his fingers upon some object on the spot—e.g., a windowpane, a knife blade. Such an imprint, if identical with the finger print of a suspect, offers almost irrefutable evidence at least of complicity. In rare instances such evidence has been offered in court, although convictions secured upon it fall, for the most part, in the realm of romance. In the nature of the case sufficiently clear imprints are seldom found and, in the absence of a general finger-print record, will seldom serve for the detection of a criminal upon whom the suspicion of guilt is not already securely fixed.

As an alternative to the Bertillon system the chief difficulty with the finger print consists in classification. Sir Francis Galton (*Finger Prints*, 1892) finds nine chief classes, or genera, with a large number of subordinate classes, or species. No two investigators, however, would agree precisely in assigning prints to species or even genera. Accordingly most criminologists reject the proposal to employ the finger print exclusively for identification, although they recognize its value in combination with other systems. Consult: L. R. Almandos, *Dactiloscopia argentina, su historia é influencia en la legislación* (La Plata, 1909); L. Seymour, *Fingerprint Classification* (Los Angeles, 1912); F. A. Brayley, *The Arrangement of Finger-prints Identification and their Uses* (Boston, 1913).

FINGER SPONGE. See GLOVE SPONGE.

FINGER SYMBOLISM. A representation of numbers known to the ancients and common in the Middle Ages. Since only one number could conveniently be represented at one time upon the abacus (q.v.), it is possible that the finger symbolism was invented to enable the calculator to hold in mind the numbers with which he was working. It is also probable that the subject was of practical value in bargaining at international fairs in the mediæval period. Nicolaus Rhabdas of Smyrna, a mediæval Greek (fourteenth century), describes the finger symbolism in use in his time and long before; thus, 80 was represented by laying the thumb of the left hand upon the palm, bending the forefinger closely over the first joint of the thumb, and slightly bending the remaining fingers. Consult Tannery, *Notice sur les deux lettres arithmétiques de Nicolas Rhabdas* (Paris, 1886), and Gow, *History of Greek Mathematics* (Cambridge, 1884). For the work of Rhabdas, consult *Notices et extraits des manuscrits de la Bibliothèque Nationale*, vol. xxxii (Paris, 1886).

FIN'IAL (from Lat. *finis*, end). A terminal carved ornament at the summit of a peak, pinnacle, gable, spire, or other pointed structure. Finials are found in Greek architecture, as in the exquisite choragic monument of Lysicrates and other works of similar form, and in nearly all subsequent styles. In Christian architecture, after the eleventh century, finials took on increasing importance with the development of steep roofs, high pointed gables, and especially of the spires and pinnacles of Gothic buildings. During the latter part of the twelfth century and the whole of the thirteenth century finials of the most perfect form and of infinite variety were used as the crowning ornaments of every salient point in the buildings of the period. Conventional foliage forms, usually in the form of crockets, were grouped around a central stem ending in a knob, bud, or flower. The architects of the fourteenth century in the finials, as in other ornaments, imitated more closely the forms of natural foliage, with greater richness but less vigor of outline than those of the preceding century. In the late Gothic of the fifteenth and sixteenth centuries the finials were made longer and more attenuated and were used to terminate the ogee drip moldings over arches as ornaments in relief on the walls as well as to terminate pinnacles and gables. Finials were carved both in stone and in wood, and in the latter material with great delicacy and minuteness. The English developed beautiful finials for the tops of wooden pew ends, especially in the fifteenth century. Finials at the points of hipped roofs, called hip knobs, were often of copper or lead, sometimes of terra cotta or of wood; and whatever the material adopted, its natural capabilities were made a source of special beauty. In Renaissance architecture finials were much less important, as steep roofs, pinnacles, and high-pointed gables passed out of use, except in transitional or early works, as in the Francis I style, which produced beautiful finials based on Roman candelabrum types. Knoblike and turned finials are common in both Renaissance and modern furniture. In Elizabethan architecture finials are almost entirely of a geometric form and without foliage, and are frequently, especially when terminating wooden gables, combinations of finial and vane, partly wood and partly iron. In the strict classic the only traces of the finial are in the balls, obelisks, etc., used as terminations and also in the shields and supporters (themselves a remnant of feudalism) which form the crowning ornament of gate piers, pedestals, etc., and which really correspond more closely to the ancient anthemion terminations. Mohammedan finials on minarets and domes are usually of metal, with balls or other swelling forms surmounted by the crescent.

FINIGUERRA, fē'nē-gwĕr'rā, MASO (TOMMASO) (1426–64). A Florentine goldsmith, draftsman, and engraver of the Renaissance. He was born of a family of goldsmiths and was probably a pupil of his father Antonio. It was formerly supposed, on the authority of the sculptor Baccio Bandinelli (q.v.), that he assisted Ghiberti on the famous portals of the baptistery; but there is no confirmation of this. The chief influence upon his art was probably that of Antonio Pollajuolo, with whom he was in partnership in 1457. In 1463 he designed cartoons for the five figures in tarsia which were carried out under the supervision of Giuliano da Majano for the sacristy of the cathedral —his only authenticated surviving work. He made his testament Dec. 14, 1464, and died shortly afterward. According to the statement of Benvenuto Cellini (q.v.), certainly an authority on the subject, he was the first master of his day in the art of niello engraving. Now we know from the records that he executed important work in this medium. His masterpiece was a "pax" of the "Crucifixion" for the baptistery of Florence. Finiguerra was long esteemed, on the authority of Vasari, the inventor of engraving on metal; but this statement is no longer credited, since it is certain that line engraving (q.v.) was practiced in Germany before his day. It seems likely, however, that a number of drawings of the school of the Pollajuoli in the Uffizi, and part of a picture chronicle in the British Museum, are by him. Consult: Duchesne, *Essai sur les nielles* (Paris, 1824); Baldinucci, *Notizie dei professori di disegno* (Florence, 1845); Colvin, *A Florentine Picture Chronicle* (London, 1898).

FI'NING (from *fine*, OEng. *finen*, to refine, from *fine*, pure, from OF., Fr. *fin*, from Lat. *finitus*, p.p. of *finire*, to end, from *finis*, end), or CLARIFICATION. The process by which turbid liquors such as beer or wine are clarified or made clear. The simplest method of fining is by passing a liquid through a porous substance, such as charcoal, a cloth, or filtering paper, which retains the solids and allows the clear fluid to pass through; but this method can be used only with those liquids that contain matter that is mechanically suspended in them. Such liquids as contain mucilaginous or other gummy matter that readily clogs the filter require special means of separation. The fact that the albumen of meat collects the mucilaginous material in soup has been taken advantage of for the purpose of fining.

In the fining of sirups and such liquors as may be heated without injury, a soluble albumen such as the white of egg may be used. To a small portion of the turbid liquid albumen is added, and after thorough mixture the portion is poured into the rest of the liquor and agitated. On the application of heat the albumen coagulates and contracts into scum that envelops and draws together the suspended matter, which may then be readily removed. As albumen is coagulated by alcohol, it may be used for fining wines and cordials without the application of heat. Malt liquors, on the other hand, are fined by means of gelatin, as isinglass. Thus, one pound of isinglass may be soaked in three or four pints of water or sour beer to which, as the isinglass swells, more sour liquor is added, until it measures a gallon. The resulting jelly is then dissolved in seven or eight gallons of liquor to be fined, and this solution, called "brewer's finings," which has the consistency of sirup, is used in the proportion of a pint to a pint and a half to a barrel of ale or porter or to a hogshead of wine. The isinglass combines with the astringent matter of the liquor, forming an insoluble solid which sinks to the bottom and carries with it the suspended matter, where it is allowed to remain, as the flavor of malt liquors depends somewhat upon the astringents they contain. For the fining of spirits a proper proportion of alum is added to the liquor and then a solution of sodium carbonate, and after agitation in the presence of air the spirit is allowed to rest for 24 hours, after which it will be found to be clarified. Frequently salts are used for fining; thus, acetate of lead is sometimes added to the liquor, and then, after thorough agitation, a solution of potassium sulphate. In this case an insoluble lead sulphate is precipitated, which carries down with it the gummy material. This process is objectionable, as lead salts are poisonous. Ox blood is sometimes used as a substitute for albumen. The best liquors need no artificial fining, as they clarify themselves, for the turbid matter sinks to the bottom soon after the fermentation is completed, and much care must be exercised in the use of finings, especially in cases where the liquors require a certain amount of astringency, briskness, and piquancy, as these qualities are diminished and the liquor is likely to become flat and vapid. Those liquors which fail to become clear when treated with finings in the usual manner are called "stubborn." Consult Gardner, *Brewer, Distiller, and Wine Manufacturer* (London, 1883).

FINISTÈRE, fē'nê'stâr' (Lat., *finis terræ*, land's end). The westernmost department of France (q.v.), comprehending a part of the former Duchy of Brittany (Map: France, N., B 4). Area, 2714 square miles. Pop., 1901, 773,014; 1911, 809,771. It is traversed from east to west by two low, picturesque chains of hills. Its coast is rugged and broken, its shores bristling with dangerous granite rocks and fringed with many islands. The soil, one-third of which is occupied by sandy tracts and marshes, is moderately productive. Corn, hemp, and flax are grown in considerable quantities, as well as fruits. On the coast are large pilchard fisheries. The silver and lead mines are valuable, those of Poullaouen and Huelgoat being about the richest in France. Capital, Quimper. Brest is the chief harbor.

FINISTER MOUNTAINS. A range of mountains in Kaiser Wilhelms Land. They reach an altitude of 11,315 feet.

FINISTERRE, fē'nê'stâr', Cape. See Cape Finisterre.

FINK, Albert (1827–97). An American civil engineer, born near Frankfort-on-the-Main, Germany. Graduating from the Polytechnic Institute (Darmstadt) in 1848, he emigrated in the following year to America, where he became a draftsman for the Baltimore and Ohio Railroad; subsequently he had charge of designing and constructing for that company the first important iron bridges in the United States. In 1857 he became an assistant to George McLeod, chief engineer of the Louisville and Nashville Railroad, and while thus connected he built the great bridge over the Ohio River at Louisville, Ky. During the Civil War he was chief engineer and superintendent of the road and machinery department of the Federal army. In 1865–75 he was general manager and in 1870–75 vice president of the Louisville and Nashville Railroad. In 1875 he organized the Southern Railway and Steamship Association, by means of which he affected a "pool" of four great trunk lines and thus revolutionized the traffic management of American railroads. In 1879–80 he was president of the American Society of Civil Engineers.

FINK, Louis Maria (1834–1904). An American Catholic prelate, born at Triftersberg, Bavaria. He was educated at Ratisbon, came to the United States in 1852, was ordained priest in 1857, and was stationed at Bellefonte, Pa., Newark, N. J., Covington, Ky., and Chicago, Ill. In 1871 he was consecrated titular Bishop of Eucarpia and appointed coadjutor to Bishop Miege, Vicar Apostolic of Kansas. He was transferred to the diocese of Leavenworth in 1877.

FIN'LAND (Fin. *Suomenmaa*, land of lakes and marshes). A grand duchy of Russia, extending from about lat. 60° to about 70° N., and lying between long. 20° 30′ and 33° E. (Map: Russia, C 2). Its extreme length is 700 miles from north to south. The greatest breadth is about 400 miles. Finland is bordered on the north by Norwegian Lapland, on the east by Russia proper, on the south by the Gulf of Finland, and on the west by the Gulf of Bothnia and Sweden. It includes part of Russian Lapland. It has an area of 144,255 square miles, of which about 35 per cent is forest (including many moors and morasses), over 11 per cent is occupied by lakes, about 3 per cent is arable, and about 5 per cent is in meadow. Finland has been called the "Land of the Thousand Lakes." Among its largest lakes are Kalla, Päyänne, Enare, Torneå, Hauki, and Saima. The last of these, about 180 miles long, is the centre of the system of water communication between the central part of the country and the Gulf of Finland. Lake Ladoga indents the southeast corner. While heights, even to 4100 feet, as in Haldisckok, are reached in the extreme north, the most of Finland contains no mountainous elevations and all reliefs have been rounded off in the south to 400 to 600 feet by the action of an ancient ice sheet. The forms of the country everywhere are due to this glaciation; bowlders, many of them so large that the peasants build houses in their shelter; lakes, lagoons, and marshes, the labyrinth of waterways, and the general alignment of the country as marked by hills and valleys. The rivers are unimportant, the chief being the Muonio, which flows between Finland and Sweden, the Kemi, and the Uleå. The coast line is generally low, skirted in the south by numerous rocky islands.

The crown forests are extensive, yielding the government a considerable income. The forest trees are mainly conifers. Oaks and other broadleaf trees are found in the southern portion. In the northern section the vegetation is that of the Arctic tundras. The chief mammals are bears, wolves, lynxes, gluttons, foxes, elk, and reindeer. Game birds and waterfowl abound, as well as fish, principally herring and salmon.

Climate. The climate of Finland is rigorous but healthful, marked by long winters and short but hot summers. It lies within the zone of cyclones and anticyclones, which pass over northern Europe from west to east at intervals of two or three days throughout the year and give variability to the winds and weather. The mean annual temperature varies between the southern and the northern boundary from 40° F. to 34° F., ranging from 20° F. to 8° F. in January, and from 64° F. to 62° F. in July. The extreme range of temperature is about 110° to 115° F. The prevailing winds in winter are from the south and southwest and in summer from the north, northwest, and west. The amount of rainfall varies from 10 inches in the northern to 25 inches in the southern part, being greatest during August. The degree of cloudiness varies from 50 per cent at the south to 72 per cent at the north.

Geology and Mineral Resources. In its geological structure Finland is closely related to the Scandinavian peninsula. Granite and Archæan rocks predominate, overlain by glacial materials. The granite is extensively quarried for building stone. Bog-iron ore and copper are the only metallic minerals of importance. The former occurs in marshes and in the numerous lakes, while the copper mines are located at Pikäranta on Lake Ladoga.

Agriculture. Owing to its situation and to the very limited cultivable area as well as to the primitive methods employed, Finland's home supply of agricultural products falls far short of the demand. In 1901 the number of farms was 271,154, of which 1855 embraced over 247 acres each. There is a large class of small-farm owners in areas ranging from 10 to 25 acres. The influence of the landed aristocracy as a class, once considerable, has greatly waned since the Law of 1863–64, which enables every citizen to buy tax-exempted land from the nobility. The state owns about one-third of the whole area and rents land on very advantageous terms, giving lessees every reasonable opportunity for purchase. Rent of private lands is paid mostly in labor. Though the laws governing the relations between tenant and landlord leave much to be desired, the condition of tenants was perhaps better during the last century than that of the average in the countries of Europe. After Finland became a Russian duchy, its agriculture underwent a significant change. Owing to the excess of pasture over arable land, the dairying industry has always been more or less important, but prior to 1850 agriculture in Finland meant chiefly the raising of rye, corn, oats, barley, and potatoes. Since then dairy products have become more prominent, and the use of machinery in their production, introduced by the example of owners of the larger estates and followed by the coöperative societies, is now very general. The wheat crop of 1910 was approximately 130,000,000 bushels; rye, 13,000,000; oats, 28,000,000; potatoes, 25,000,000. Finland exports annually about $8,000,000 of animal products, chiefly butter. In the development of its fisheries as well as of its live-stock interests the country has greatly advanced.

Manufactures. Naturally Finland is not favorably situated for manufacturing, although the numerous streams offer an abundant supply of power. During the period of 1887–1902, however, the number of manufacturing establishments grew from 5615 to 8534 (52 per cent gain); the number of workmen employed increased from 43,085 to 95,282 (121 per cent); and the value of products, exclusive of flour, rose from about $22,500,000 to about $59,800,000 (161 per cent). In 1910 the product of the wood industries was valued at $28,000,000; textiles, $13,000,000; paper, $18,000,000; iron and mechanical works, $10,000,000.

Commerce and Transportation. Respecting commerce Finland has been practically independent of Russia. The Finnish manufacturer gets his material much cheaper than the Russian, hence has been able to compete with the latter even in the Russian market. The great difference between the prices on certain manufactures in Finland and in Russia has led to extensive smuggling. These difficulties, however, were somewhat obviated after a measure was instituted by the Czar in 1897, which provided that all articles of Russian origin, except spirits, sugar, salt, tobacco, and beer, were to be admitted free to Finland; all agricultural and handmade articles from Finland were to be passed free into Russia; all products of the principal industries were to be liable to differential duties; the remainder were to be treated in the same way as foreign products. Finland's annual imports increased from $28,120,000 in 1890 to $91,500,000 in 1911, and its exports from $18,480,000 to $62,180,000. The imports comprise chiefly foodstuffs, metal products, textiles, and machinery. About 15 per cent of the exports consist of animal products, mostly butter, and about 70 per cent of wood and wood products, including paper and pulp. Timber is the leading export and amounted in 1912 to $32,038,000; paper and wood pulp, $12,352,000; butter, $6,750,000. The trade is mainly with Russia, Germany, Great Britain, Denmark, and Sweden, named in the order of their importance. The transportation facilities are fully adequate to the demands of the country. Its even surface greatly facilitates the construction of common roads, of which there are over 30,000 miles. The numerous lakes are utilized freely for transportation, and, joined by short canals, they afford continuous waterways. The first railway in Finland was completed in 1862—a line of about 88 miles between Helsingfors and Tavastehus. In 1911 there were 2,332 miles, of which only 182 miles were owned by private companies. The income of the state lines forms an important item in the budget.

Finance and Banking. The revenues of Finland amounted in 1911 to about $31,200,000, and the expenditures $30,100,000. The largest expenditures were for public works (mainly railroads), administration and service of the debt, worship and education, and military affairs. The public debt, contracted exclusively for railway construction, amounted at the beginning of 1911 to about $34,000,000. Finland has a gold standard, and the unit of value is the mark, or markka, equivalent to 19.3 cents, the same as the French franc. The chief financial concern is the Bank of Finland, a state institution established in 1811, and by means of which most of the financial undertakings of the state are carried out. The first savings bank was established in 1823. In 1911 there were altogether 382 savings banks, mostly private, but under the supervision of the state, with 308,939 depositors, and deposits amounting to $48,700,000.

Government. The position of Finland in the Russian Empire is that of a grand duchy, with its own constitution, and practical autonomy in its internal affairs, all diplomatic relations, however, being carried on by the Empire. The executive department consists of the Senate (which meets at Helsingfors), whose members are nominated by the Emperor (the Grand Duke of Finland), the Governor-General, and the State's Secretariat for Finland at St. Petersburg. The national Diet was formerly composed of nobles, clergy, burghers, and peasants, but was reorganized in 1906 to consist of one chamber of 200 members chosen by direct and proportional election, in which all entitled to suffrage have an equal vote. The suffrage is possessed by both sexes alike, on reaching the age of 24, and both sexes are eligible to the Diet; and the first election resulted in the selection of 19 women as members of the Diet. The Diet has power to consider and act upon all matters not affecting fundamental laws or the organization of land and sea defense. In 1910, however, the Russian government enacted a law depriving the Diet of the right to legislate on taxation, police direction, school management, and control of the press, and in 1911 the Russian Duma enacted a law placing Russians on an equality with Finns in the grand duchy. (See *History*, below.) The Finnish army, according to the provisions of the Defense Law of 1878, could not be required to serve outside of Finland and is under the command of Finnish officers.

Population and Religion. The population of Finland numbered 2,060,782 in 1880, 2,712,562 in 1900, 2,857,038 in 1904, and 3,154,284 in 1911. Estimated population, Dec. 31, 1919, 3,335,237. The females exceeded the males in 1904 by 22,580, and the urban population formed only about 13 per cent of the total. The chief cities and their populations (1910) are: Helsingfors (the capital), 147,218; Abo, 49,691; Tammerfors, 45,442; and Viborg, 27,508. As regards religion in 1910 there were 3,057,627 Lutherans, 52,004 Greek Orthodox. The language of the country is Finnish, although Swedish is spoken by the higher classes, in addition to the Swedes, who form about 13 per cent of the population. The Russians number but a few thousand. See FINNS.

The University of Helsingfors is at the head of the Finnish educational scheme. It was founded at Åbo in 1640 and transferred to Helsingfors in 1827. In 1912 it had an attendance of 3030, of whom 730 were women. There were 69 lyceums in 1912. Primary instruction is furnished by public, parochial, and traveling schools. According to the school census of 1896, out of 457,678 children of school age only 17,771 received no education. The public schools are maintained largely by local funds, but receive a subvention from the government. Finland has a large number of periodicals and not a few learned societies.

History. The Finns are said to have dwelt on the Volga in the seventh century and to have been driven northward at the beginning of the eighth. The true Finns call themselves Suomi. In the twelfth century the Swedes began the long struggle which ended in the closing years of the thirteenth century in the Christianization of the people and their subjection to Swedish sovereignty. Henrik, the English-born Bishop of Upsala, who accompanied the first Swedish expedition in 1157, was murdered by a Finn and became Finland's patron saint and martyr. For over 500 years Finland remained an appanage of the Swedish crown. Gustavus Vasa (q.v.) introduced the Lutheran religion in 1528, and John III made the country a grand duchy. Under Swedish rule the people enjoyed an autonomous constitutional government and developed a simple, intelligent, and unique civilization. While Finnish remained the language of the peasantry, Swedish became that of the towns and of the cultivated and official classes. During the long wars between Russia and Sweden, Finland was frequently a battle ground, and as the Finnish frontier is only 33 miles from St. Petersburg, it was naturally desired by the former country to round out its territory and complete its defenses. This desire was realized in the Peace of Fredrikshamn, Sept. 17, 1809, following upon a Russian invasion, by which Sweden ceded the grand duchy with the Åland Islands to Russia. Alexander I (q.v.) guaranteed to Finland the preservation of its laws, constitution, and religion, and this pledge was solemnly renewed to the Finnish Diet by every Czar including Nicholas II. In 1897, however, the Russian government began a series of systematic attacks, culminating in the attack on Finnish liberties and the manifesto of Feb. 15, 1899, which removed from the competence of the Diet all matters affecting the grand duchy in common with Russia proper. The Russification of the country was carried on under the auspices of the notorious Plehve, who was made Secretary for Finland in 1899. Between 1900 and 1902 the incorporation of the Finnish army was decreed, Russian was made the language of higher administration and of the Senate, and Russian subjects were made eligible for service under the government. Finally, the Governor-General, Bobrikoff, was invested with dictatorial powers (April 15, 1903) and proceeded to suppress freedom of assembly and the press and to exile the most prominent leaders of the opposition. On June 16, 1904, Bobrikoff was assassinated. He was succeeded by Prince Obolenski. The revolutionary agitation in Russia (1905) found no echo in Finland in the beginning; even the creation of a state Duma for Russia was regarded as not affecting the peculiar status of Finland under its own Diet. On October 30, however, the workmen at Helsingfors decided to join in the general strike which was raging in Russia. A tremendous public upheaval followed, which in one day, and without recourse to arms, succeeded in sweeping away the work of Russian aggression during the previous eight years. On October 31 a deputation presented to Prince Obolenski a series of popular demands, including the repeal of all illegal ordinances and the immediate convocation of the Diet. These demands Prince Obolenski promptly granted. On November 4 the Czar signed a manifesto summoning an extraordinary meeting of the Diet on December 20. This was followed by absolute quiet in Finland. On May 29, 1906, the Diet adopted a radical system of representation. See GOVERNMENT. Finland proclaimed her independence Dec. 9, 1917, and established a Republic. Her independence was recognized by practically all the European powers immediately and by the Russian Soviet government on Jan. 9, 1918. Civil war immediately broke out between the red guards (Bolshevik) and the white guards (pro-German). Throughout the year the German influence was predominant. In July, 1919, however, Professor K. J. Staahlberg, a strong Finnish nationalist was elected president of the Republic over General Mannerheim, his pro-German opponent, as a result of a *bloc* formed by Socialists, Agrarians, and Progressives. The German influence was largely wiped out and Finland began her career as a really independent state. See SUPPLEMENT.

Consult: Mechelin and others, *Finland im 19ten Jahrhundert* (Helsingfors, 1894; Fr. trans., 1900); Tweedie, *Through Finland in Carts* (London, 1897); *Statistisk Arbok för Finland* (annual, Helsingfors); Barnhak, *Russland und Finland* (Leipzig, 1900); *The People of Finland in Archaic Times* (London, 1892); Koskinen, *Finnische Geschichte* (Leipzig, 1873); Jonas, *Das Grossfürstentum Finland* (Berlin, 1886); Fisher, *Finland and the Tsars* (London, 2d ed., 1900); Nyholm, *Die Stellung Finlands im russischen Kaiserreich* (Leipzig, 1901); Arnheim (ed.), *Der ausserordentliche finländische Landtag, 1899* (Ger. trans. from the Finnish, ib., 1900); Getz, *Das staatsrechtliche Verhältnis zwischen Finland und Russland* (ib., 1900); De Windt, *Finland as It Is* (New York, 1903); M. Robinson, *Finland* (ib., 1905); Wainerman, *A Summer Tour in Finland* (London, 1908); Chalhoub, *La Finlande* (Paris, 1910); Renwick, *Finland To-Day* (London, 1911); E. Travers, *Letters from Finland* (ib., 1911); E.

Young, *Finland* (ib., 1912); R. Butler, *New Eastern Europe* (New York, 1919); M. P. Thompson, *Finland* (New York, 1921). See Russia; Sweden.

FIN'LAND, Gulf of. An arm of the Baltic Sea bounded by Finland on the north and east, the Government of St. Petersburg on the east and south, and Esthonia on the south (Map: Russia, B 3). It extends in an easterly direction for over 250 miles and varies in width from about 12 to over 80 miles, its narrowest point being at the east end. Its depth ranges from 26 to over 200 feet, although in a few places it exceeds 300 feet. The north coast is rugged and bordered with numerous small islands. There are also islands, mostly uninhabited, in the midst of the gulf. By the Neva and the Ladoga Canal the gulf is connected with the lakes of Ladoga and Onega, while the Narova connects it with Lake Peipus. Besides the two above-mentioned rivers, the gulf receives a number of small streams, both from Finland and from Esthonia. Navigation is greatly hindered by sand banks and rocks, and by ice during the winter. Among the ports are Reval, Kronstadt, on a powerfully fortified island protecting the Neva, Viborg, and Helsingfors.

FIN'LAY, George (1799–1875). An English historian, born at Faversham (Kent). He studied law in an office at Glasgow and Roman jurisprudence at Göttingen. In 1823 he proceeded to Greece, met Byron, went to Missolonghi, but soon left for Italy and thence for Scotland, where he concluded his legal studies and passed his civil-law examination. In 1826 he was once more in Greece and from that time until the termination of the war (1829) was either in active military service or employed in missions on behalf of the patriot cause. He then bought an estate in Attica and devoted himself to agriculture and writing history. Among his works are *Greece Under the Romans* (1844); *A History of the Byzantine and Greek Empires from 716 to 1453* (1854); *Greece under Ottoman and Venetian Domination* (1856) and *Greek Revolution* (1861). These, with manuscript corrections and additions by the author, were published at Oxford under the editorship of H. F. Tozer as *A History of Greece, from its Conquest by the Romans to the Present Time, 146 B.C. to 1864 A.D.* (1877). Consult the *Autobiography* in vol. i of the Oxford edition.

FIN'LEY, James Bradley (1781–1856). An American Methodist Episcopal clergyman, born in North Carolina. He entered the ministry in 1809; was for six years superintendent of the mission to the Wyandot Indians, for three and a half years chaplain of the Ohio penitentiary, and for 21 years presiding elder; and was a member of eight general conferences. He was author of *The History of the Wyandot Mission* (1842); *Life Among the Indians*, ed. by D. W. Clark; *Sketches of Western Methodism*, ed. by W. P. Strickland. Consult his *Autobiography*, ed. by W. P. Strickland (Cincinnati, 1854; 2d ed., 1857).

FIN'LEY, John Huston (1863–). An American educator and editor. He was born at Grand Ridge, Ill., studied at Knox College (A.B., 1887) and at Johns Hopkins University, and became secretary of the New York State Charities Aid Association. He was president of Knox College from 1892 until 1899, editor of *Harper's Weekly* (1899), and editor of *McClure's Magazine* (1899–1900). In 1900 he became professor of politics in Princeton University, in 1903 president of the College of the City of New York, and in 1913 New York State Commissioner of Education. He was Harvard University exchange lecturer on the Hyde Foundation at the Sorbonne, Paris, in 1910–11, served as president of the American Social Science Association after 1910, became a member of the National Institute of Arts and Letters, and received the degree of LL.D. from several colleges and universities (including Columbia, 1914). He wrote: *Taxation in American States and Cities*, with Richard T. Ely (1889): *The American Executive and Executive Methods*, with John F. Sanderson (1908).

FINLEY, John Park (1854–). An American meteorologist, born at Ann Arbor, Michigan. He graduated at the State Normal School at Ann Arbor and continued his studies at the Michigan State Agricultural College. As assistant to the chief signal officer at Washington, he instituted the system of meteorological reports from localities where there were no regular signal-service officers by means of volunteer observers. He was later placed in charge of the Signal Service Bureau on the Pacific coast, where his observations were of great value. His writings are extensive, his investigations regarding the phenomena of tornadoes being his most valuable contribution to meteorology. Among his published works are: *Tornadoes* (1887); *Manual of Instruction in Optical Telegraphy* (1889); *Sailor's Handbook of Storm-Track, Fog, and Ice Charts of the North Atlantic and Gulf of Mexico* (1889); *Essay on the Development of Tornadoes* (1890); *Certain Climatic Features of the Two Dakotas* (1893).

FINLEY, Martha (Martha Farquharson) (1828–1909). An American author. She was born in Chillicothe, Ohio, lived for many years in Philadelphia, and became widely known for her numerous stories of the Sunday School Library type. Her "Elsie Series" (26 vols.), "Mildred Series" (7 vols.), and "Finley Series" (7 vols.) for adults, and many Sunday-school books, including the "Do-Good Library" (9 vols.) and the "Pewit's Nest Series" (12 vols.), were very popular. Among her many other publications are *An Old-Fashioned Boy* (1871) and *The Thorn in the Nest* (1886).

FINLEY, Robert (1772–1817). The organizer of the Colonization Society, born at Princeton, N. J. He graduated at the college in his native town at the age of 15 years and taught school there, in Allentown, N. J., and in Charleston, S. C. In 1794, having returned North, he was licensed as a minister by the Presbytery of New Brunswick, N. J., and in 1795 accepted a call to Basking Ridge, N. J. From a study of the negro question he came to the conclusion that the only solution of the problem was to colonize these people in some remote region, preferably on the coast of Africa. In December, 1816, he went to Washington, D. C., where he organized the Colonization Society (q.v.), and among those who became interested in the project was John Randolph of Roanoke. At this time Dr. Finley was not aware that Jefferson had suggested a similar plan in a letter written in 1811, nor that only the previous autumn a motion had been made in the Virginia Assembly to colonize free blacks on the Pacific coast. In January he returned to New Jersey, where he organized an auxiliary society, and then went South again and became president of the University of Georgia, where he died.

FINLEY, Samuel (1715–66). An American clergyman of the Presbyterian church, born in County Armagh, Ireland. He came to Philadelphia in 1734, was licensed to preach in 1740, was ordained by the New Brunswick Presbytery in 1742, and in 1743 was settled at Milford, Conn. Having preached at New Haven to the "Second Society" of that place, an organization unrecognized by the church, he was seized as having violated the law forbidding itinerants to preach in any parish without the consent of the settled pastor, and was ejected from the Colony as a vagrant. From 1744 to 1761 he was pastor at Nottingham, Md., where he also conducted an academy of considerable reputation. In 1761 he became president of Princeton. His publications consisted entirely of sermons, among them *Christ Triumphing and Satan Raging* (1741); *Satan Stripped of his Angelic Robe* (1743); *A Charitable Plea for the Speechless* (1747); *On the Death of President Davies* (1761).

FINN, Frank (1868–). An English ornithologist, born in Maidstone. He was educated at Oxford, where he was classical scholar at Brasenose College. He went on a collecting expedition to East Africa in 1892, was assistant superintendent (1894) and deputy superintendent (1895–1903) of the Calcutta Indian Museum, and in 1909–10 edited the *Avicultural Magazine*. Some of his books are: *Fancy Waterfowl* (1900); *Fancy Pheasants* (1901); *Garden and Aviary Birds of India* (1906); *Indian Waders* (1907); *The World's Birds* (1908); *The Making of Species* (1909), with Dewar; *Eggs and Nests of British Birds* (1910); *Talks About Birds* (1911); *Game-Birds of India and Asia* (1911); *Wild Animals of Yesterday and Today* (1913).

FINNER. See Finback.

FIN'NEY, Charles Grandison (1792–1875). An American clergyman and educator, born at Warren, Conn. He began the study of law in 1818, in 1821 abandoned the law for theology, was licensed to preach by the Presbyterian church in 1824, and was active as an itinerant evangelist from that time until 1835 and at subsequent intervals. In 1834 he became pastor of the Congregational Church known as the Broadway Tabernacle, New York City. He was called to the chair of theology in Oberlin College in 1835, was appointed pastor of the Congregational Church at Oberlin in 1837, and from 1851 to 1866 was president of the college. In 1849 and 1858 he visited England as a revivalist. He established the *Oberlin Evangelist* in 1839 and was its editor until 1863. Among his publications are: *Lectures on Revivals* (1835; 14th ed., enlarged, 1868); *Sermons on Important Subjects* (1839); *Lectures on Systematic Theology* (2 vols., 1847; new ed., 1878). Consult his *Memoirs* (New York, 1876; 2d ed., 1903).

FINNISH LANGUAGE AND LITERATURE. The Finnish language belongs to the Finno-Ugric branch of the Uralo-Altaic family of languages. The tongues of the Finno-Ugric group are spoken in Finland, Lapland, and part of the Baltic provinces by a number of Finnic tribes scattered over a vast area in northern and eastern Russia and western Siberia and by the Magyars of Hungary. The richest and most highly cultivated languages of the group are the Suomi, the language of Finland, and the Magyar (Hungarian). The dialects are all distinctly agglutinative forms of speech, with decided tendencies towards inflection, so much so that in many grammatical endings the essential difference between agglutination and inflection becomes obscured. As in other Uralo-Altaic tongues, progressive vowel harmony forms a characteristic feature of the Finnish group. The Finnish language is spoken by over 2,500,000 people and in several different dialects, of which the most important are the East Finnish, or Karelian, the South Finnish, and the West Finnish. The first of these is the oldest and least developed; the second is the main vehicle of Finnish literature. It is emphatically vocalic. It has five fundamental vowels—*a*, *e*, *i*, *o*, and *u*—and employs two diphthongs. The grammatical relations between the several parts of speech are expressed exclusively by suffixes. Nouns are used without any article, have no gender, and are declined, in both singular and plural, through 15 different cases, so as to express the relations which in the Indo-Germanic languages are commonly indicated by prepositions. Verbs have but two tenses, present and past, the future tense being expressed by a circumlocution; but their conjugation is very intricate. The language is capable of expressing the nicest shades of meaning. Consult Eliot, *Finnish Grammar* (Oxford, 1890); Ojansuu, *Suomen lounaismurteiden äännehistoria; vokaalioppi, descendentti csitys* (Helsingfors, 1901); Karsten, "Några germanska lånord i finskan" (*Nordiska Studier*, 1904); Zaborowski-Moindron, "Relations primitives des Germains et des Finnois" (*Soc. d'Anthrop. de Paris*, 1907); Karsten, "Altdeutsche Kulturströmungen im Spiegel des finnischen Lehnworts (*Indogermanische Forschungen*, 1910); Szinnyei, *Finnisch-ugrische Sprachwissenschaft* (Leipzig, 1910); Poirot, *Beiträge zur Kenntniss der Quantität der finnisch-ugrischen Sprachen* (Helsingfors, 1912). Erwast, *Finnisch-deutsches Wörterbuch* (1888) is still the standard work.

The chief monument of Finnish literature is the *Kalevala*, a sort of epic poem, which until the last century existed only in the memory of the peasantry. A collection of some of the scattered parts of this poem was published in 1822 by Zacharias Topelius; but Elias Lönnrot, 13 years later, published a far more complete collection, at the same time giving to it the name by which it is now known. Lönnrot wandered from place to place among the peasantry, taking down from their lips all that they knew of their popular songs. After unwearied researches he was successful in collecting 12,078 lines, which he arranged into 32 runes, or cantos, and published exactly as he heard them sung or chanted. Continuing his researches, he published in 1849 a new edition of 22,793 verses, in 50 runes. The importance of this long-hidden epic was at once recognized in Europe, and translations of it were made in several languages. Some specimens of it were translated into English by Professor Porter of Yale, and published in New York in 1868. The entire poem was translated by J. M. Crawford (1888). It has been several times translated into Swedish, the first time by Castrén, and there are versions in German by Anton Schiefner (1852), in French by L. de Duc (2 vols., 1867), in Hungarian by Ferdinand Barna

(1871). The poem is written in eight-syllabled trochaic verse, and an idea of its style may be obtained from Longfellow's *Hiawatha*, which approaches a true imitation of the Finnish epic. The *Kalevala* is concerned entirely with the mythology or folklore of the people. In the story there is a certain unity of plot, though the various parts are not perfectly homogeneous and appear to be the product of different minds at different periods, the various songs having evidently received additions in course of time. They probably originated before the Finns were converted to Christianity, and when they were not scattered as they are now. When Lönnrot collected the *Kalevala* songs, he also gathered a considerable quantity of lyric poetry, which he published under the name of *Kanteletar*, from the name of the national instrument to which they are sung—a species of harp with five strings. Of recent Finnish poets the most popular seems to be Paavo Korrhoinen, a peasant, a very sarcastic writer. Other modern poets are Marteska, Kettunen, Ilhainen, Oksaselta, the brothers Leino. Finnish poets that have used Swedish are treated under SWEDISH LANGUAGE AND LITERATURE. The Finns delight in proverbs, Lönnrot having published a collection of upward of 7000, with about 200 charades, while considerable collections of legends and tales have been published. The first printed book in Finnish was probably the *Abecedarium* of Michael Agricola, Bishop of Åbo, which appeared about 1542. A translation of the New Testament by the same Bishop appeared in 1548 at Stockholm. The whole Bible was not translated into Finnish till 1642. During the last two centuries there has been considerable literary activity in Finland, and books in almost every branch of research are found in the language, mainly translations or adaptations. Finland is rich in periodicals of all kinds, the publications of the Finnish societies of literature and of the sciences and other learned bodies being specially valuable. Works on Finnish history and geography are quite numerous. The publication of the *Kalevala* gave a powerful impetus to the study of the Finnish language and the development of a national literature whose growth was fostered by the Society for Finnish Literature. The prominent names are Yryö-Koskinen in history, Alexis Stenwall (known as "Kivi"), Erkko (also a lyric poet) and Canth in the drama, and in fiction Juhani Aho, Ingman, Pakkala, and Leino. Among these Aho holds the first place as stylist in a medium which he has been largely instrumental in shaping to literary use. Consult: Comparetti, *Traditional Poetry of the Finns*, trans. by Anderton with an introduction by Andrew Lang (London, 1898); Vasenius, *Ofversigt af Finlands Litteratur-historia för skolor* (Helsingfors, 1893); Billson, *Popular Poetry of the Finns* (London, 1900); Setälä, *Die finnische Litteratur* in *Die osteuropäischen Sprachen* (Leipzig, 1908), which contains a good bibliography.

FINNISH MUSIC. As in the case of all nations that have developed a distinctive national art, the music of the Finns also rests upon their primitive folk music. These old strains form a connecting link between the Scandinavian and Russian folk music. Both the Runic songs (ranolaulua) and the horn melodies (torventuitotusta) of the Finns exhibit that strange, fascinating monotony produced by the constant repetition of some short motive. A distinctive feature is the prevalence of the $\frac{5}{4}$ rhythm. The prevailing mood is one of melancholy with frequent touches of the fantastic and demonic. The national instrument was the kantela, which, in a modified form, is still in use among the common people. It was a horizontal harp having originally five strings. Gradually this number was increased until at the present day the instrument has 13 strings, tuned in the scale of G minor. A national Finnish art music begins with Frederick Pacius (1809–91), who studied under Spohr and Hauptmann. In 1834 he became musical director at the University of Helsingfors, where he established a choral and symphony society and introduced the works of the German classicists and early romanticists. In his own compositions he betrays the influence of Spohr and Mendelssohn, but obtains national color through the introduction of Finnish folk strains. Ehrström, Greve, Moring, Collan, Linsén, Borenius, Wasenius, and others followed his example. In the works of Martin Wegelius (1846–1906) the influence of Wagner became noticeable and led to the establishment of a Finnish romantic school, whose chief exponent is Robert Kajanus (1856–) (q.v.), a composer of decided talent, who at the same time developed the orchestral society founded by Pacius into the Helsingfors Philharmonic Society, an excellent body of instrumentalists capable of performing the most difficult works. In Jean Sibelius (1865–) (q.v.) has arisen a real master of pronounced individuality, whose cantatas, symphonies, and chamber music have attracted wide attention in Europe and America. The untimely death of the remarkable Ernest Mielck (1877–99) was a serious loss to Finnish music. While at present Sibelius is the towering figure, occupying a place in Finnish music similar to that of Tschaikowsky in Russian music, other composers of distinction are Armas Järnefelt, Oscar Merikanto, Erik Melartin, and Ilmari Krohn. Consult K. Flodin, *Die Entwicklung der Musik in Finland* (Berlin, 1903), and W. Niemann, *Die Musik Skandinaviens* (Leipzig, 1906).

FINNISH VERSION. See BIBLE.

FINNS. A people of northern and eastern Europe and western Siberia. Ethnologically they have been classed with Lapps, but Ripley calls attention to the fact that among the Esths on the Baltic coast, through the Tcheremisses on the Volga, and beyond the Ural Mountains among the Ostiaks and Voguls in Siberia, exists a long-headedness not a whit less pronounced than throughout Teutonic Germany. The Finns described by Retzius and others are said to be tall men, with fair skin, flaxen hair, and blue eyes. Height (Tavastians), 1.682 meters; soldiers, 1.713 meters. The cranial index among the Livs, Esths, Tcheremisses, Tchuvashes, and Vogul-Ostiaks, is as low as 79 or 80. There are, however, peoples speaking Finnish dialects who are short and brachycephalic. Indeed, they are mixed in blood and necessarily present inharmonious characteristics.

Finnish-speaking people having in their veins more or less Finnish blood may be divided as follows:

TCHUDIC BRANCH

1. FINNIC OR SUOMIC. The Finnish language proper, or Suomi, is spoken in Finland and the border regions of Russia proper.

2. Esths. Esthonia, Livonia, etc., in Russia.
3. Tchuds. Olonetz and Novgorod, Russia.
4. Lapps. Lapland, in Norway and Russia.
5. Vots. St. Petersburg Government in Russia; uncertain.
6. Livs and Krevings. In Livonia and Courland, Russia; not certain.

PERMIAN BRANCH

1. Votiaks. Between the Kama and Viatka rivers in Russia.
2. Sirians. Mostly on the Vytchegda River, East Russia.
3. Permiaks. Perm, Russia. Bissennian dialect, with Votiaks.

VOLGAIC BRANCH

1. Tchuvashes. Kazan, Saratov, Simbirsk, and Orenburg, Russia.
2. Mordvins. Chiefly between the Oka and Volga rivers, East Russia.
3. Tcheremisses. Viatka, Kazan, Kostroma, and Nizhni Novgorod, Russia.

UGRIC BRANCH

1. Magyar or Hungarian. Hungary; with the Székler dialect in Transylvania.
2. Samoyeds. Twenty thousand in all. A few in North Russia, but chiefly in Siberia.

Consult Ripley, *The Races of Europe* (New York, 1899), with excellent bibliography from Castrén (1857) to Niederle (1896). See Finnish Language and Literature.

FINS'BURY. A northern district and central parliamentary borough of Greater London, England. It consists of Holborn, central and east divisions, with a population in 1911 of 87,923. In Jonson's day, as Finsbury Field, it was a resort for the commoner classes of the capital, and as such is mentioned by Shakespeare in *Henry VI* (First Part). It was also a resort of Samuel Pepys and is the burial place of John Bunyan, George Fox, Daniel Defoe, and Susanna, the mother of John and Charles Wesley. John Wesley's house here is preserved as a museum.

FINSCH, Otto (1839–). A German zoologist and ethnologist, born at Warmbrunn, Silesia. He was in commercial business for a time, but early developed an interest in natural history and in 1860 became an assistant in the Leyden Museum. In 1864–78 he was in charge of the Natural History and Ethnological Museum in Bremen. He undertook expeditions to North America (1872), Lapland (1873), western Siberia (1876), the South Seas (1879–82), and New Guinea (1884–85). In 1898 he returned to the Leyden Museum, but in 1904 took charge of the department of ethnography in the Brunswick Museum. Among his works are: *New-Guinea und seine Bewohner* (1865); *Die Papageien* (1868–69); *Die Vögel Ostafrikas* (1870); *Reise nach Westsibirien* (1879); *Samoafahrten* (1888); *Ethnologische Erfahrungen* (1893); *Systematische Ubersicht der Ergebnisse seinen Reisen* (1899); *Der Dujong* (1901).

FINSEN, fĭn'sen, Niels Ryberg (1860–1904). A Danish physician. He was born in Thorshavn and graduated from the medical school at Copenhagen in 1890. In 1893 he invented the method of treating diseases with decolorized light rays. More than 2000 patients were treated for cancers, etc., at his Institute for Phototherapy. He was awarded the Nobel prize for medicine in 1903. His works include: *Das Licht als Incitament* (1895); *Ueber die anwendung von konzentrierten chemischen Lichtstrahlen in der Medizin* (1896); *La Photothérapie* (1899).

FIN'SEN LIGHT. See Phototherapy.

FINSTERAARHORN, fĭn'stĕr-är'hôrn. The highest peak of the Bernese Alps, having an altitude of 14,026 feet (Map: Switzerland, C 2). See Alps.

FINSTERWALDE, fĭn'stĕr-väl'de. A small town of Prussia, situated on the Shackebach, an affluent of the Black Elster, 40 miles north of Dresden (Map: Prussia, E. 3). It has a sixteenth-century Gothic church, an old castle, and manufactures cloth, machinery, heavy iron castings, cigars, screws, de luxe furniture, rubber goods, soap, glass, bricks, and toys. Pop., 1900, 10,726; 1910, 13,111.

FIOCCHI. See Fenestella (the Roman historian).

FIOGO. See Kobe.

FIONN, FINN, or **FIND.** See Fenian Society; Fionn Maccumhail.

FIONN MACCUMHAIL, fĭn măc-cōōl' (i.e., 'Fionn, son of Cumhail'). An Irish epic hero, leader of the Fianna, or band of professional soldiers who lived exclusively for war and hunting, about the third century of the Christian era. Although, as always in ancient sagas, we find much of myth interwoven with the story of his life and exploits, there seems no reason to doubt the basic truth of the tradition. His grandfather was said to have been a druid, and his father, Cumhail, was a great leader of the Leinster warriors. Fionn's chief opponent was Aedh, or Iollann, afterward called Gol mac Morna, who was the head of the Connacht Fianna. Goll had slain Fionn's father in the battle of Cnucha, and though he afterward served under Fionn they had no affection for each other. Fionn is said to have been killed at Ath Brea on the Boinn by the darts of Aichlech, son of Duibhrenn. This event is usually placed in the years 252 or 283 A.D. It was Fionn's son Oisín (called Ossian in Scotland) who in later times became famous as the great poet of the Celtic people. Among the Scotch Gael, Fionn's name sometimes takes the form of Fionngall, i.e., Fionn the Stranger, indicative of an outside origin. Fionn's chief abode was at Almhain in Kildare, and his wooing of Grainne, daughter of his enemy Cormac, supreme King of Ireland, and her elopement with Diarmuid forms the subject of one of the longest sagas of this cycle. But Fionn finally overcame his rival and married Grainne in his old age. The magnificence of Fionn's abode as well as his hospitality and the bravery of his followers is described at length in the sagas. Lists are given of his famous warriors, and even of his hounds, among which Bran was the most wonderful. Though renowned as a poet—according to O'Curry, no less than seven poems in the ancient manuscript are attributed to him—his chief glory seems to rest in the fact that he was leader of the Fianna at the time when they were in their greatest strength. Before a soldier could be admitted into his select body he was obliged to promise never to receive a portion with a wife, but to choose her for her good manners and virtues; never to offer violence to any woman; never to refuse assistance to the weak and the poor;

never to flee even before nine champions; and never to exact *eric*, or revenge for the death of any member of his family or clan, which, of course, meant a complete severance of all tribal relations. Other conditions imposed upon the aspirants were equally exacting. He was first required to have passed through the whole scholastic training expected of a man of learning and to be versed in 12 books of poetry. His fleetness of foot must be so great that he could escape from a body of men following in his wake without breaking a bough or disturbing a plait of his hair; he must be able to extract a thorn from his foot while running at full speed; he must defend himself from a hole in the ground reaching to his waist with only a shield and hazel stick for weapons against nine warriors armed with spears. In spite of its good qualities the exactions made by this order upon the clansmen finally became so great that they brought about its downfall about the time of Fionn's death. The Fenian sagas are therefore naturally concerned with the deeds of Fionn and his warriors, relating principally to war and the chase; but their deep feeling for nature, their delight in fairies and phantoms, their love for the humorous and grotesque, as well as their democratic tone, distinguished them from the tales of the aristocratic Ulster cycle which had prevailed in Ireland for generations previous. Tales of the Fenians are still related in Scotland and Ireland, possibly out of respect for the legend that if these warriors were not mentioned for 24 hours they would rise again. A later bardic tradition attempted to attach the Fenian sagas to the introduction of Christianity into Ireland and related that Oisín returned to be baptized after a sojourn of 200 years on an enchanted island of perpetual youth. From metrical fragments of the Gaelic tradition, collected in the Highlands, Macpherson elaborated his celebrated *Poems of Ossian*. Consult: Maclean, *The Literature of the Celts* (London, 1906); Hyde, *Literary History of Ireland* (ib., 1906); Hull, *Text Book of Irish Literature* (2 vols., ib., 1908–10).

FIO′RA. A village in Switzerland. See Flüelen.

FIORD, or **FJORD**, fyôrd (Norw., Dan., bay, inlet). An inlet of the sea, or a narrow bay, indenting a mountainous coast and penetrating deeply into the interior. Fiords are bordered by steep, rocky walls, which descend without interruption to considerable depths below water level. Their origin is usually explained by subsidence of the coast, whereby the sea floods the valleys and washes directly against the mountain flanks. Glacial erosion may have been a factor in determining the prominent relief of the land previous to submergence. The most notable fiords are on the coast of Norway, the longest being the Sogne Fiord, which extends inland for a distance of 112 miles, is 4000 feet deep in places, and is shut in throughout its entire length by high and precipitous rock walls. Hardly less prominent are the fiords of Christiania and Trondhjem. The coasts of British Columbia and southern Alaska, of Iceland, Greenland, Patagonia, and of parts of New Zealand are marked by similar inlets. They are also found on the coasts of Maine and Nova Scotia. Many of the lochs and firths indenting the shores of the British Isles possess the characteristics of fiords. See Shore.

FIORE, fyō′rā, Pasquale (1837–). An Italian jurist, born at Terlizzi, Bari. He was appointed professor of constitutional and international law at the universities of Urbino (1863), Pisa (1865), Turin (1876), and Naples (1881), and wrote the following works, some of which have been translated into French and Spanish: *Elementi di diritto constituzionale* (1862); *Diritto internazionale privato* (1869); *Trattato di diritto internazionale pubblico* (1879); *Trattato di diritto internazionale penale; Diritto internazionale privato* (1901); *Le droit internazionale codifié et sa sanction juridique* (Fr. trans., 1911, of work published in 1907).

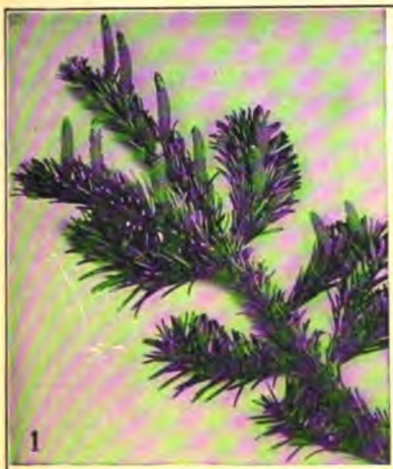
FIORE D'URBINO, fyō′rā dōōr-bē′nô, Il. See Barocci, Federigo.

FIORELLI, fyô-rĕl′lē, Giuseppe (1823–96). An Italian archæologist, born in Naples. In 1845 he was made inspector of the ruins of Pompeii, but was displaced because of his political opinions. Upon the establishment of the Kingdom of Italy he became superintendent of antiquities in the southern provinces and also professor of archæology in the University of Naples (1860). In 1860–75 he prosecuted, more systematically than had ever been done before, the excavation of Pompeii. (Consult Mau-Kelsey, *Pompeii: Its Life and Art*, 2d ed., New York, 1902.) In 1875 he was made director of all the excavations in the country, with headquarters at Rome. His publications include: *Osservazioni sopra talune monete rare di città greche* (1843); *Monete inedite dell' Italia antica* (1845); *Notizia dei vasi dipinti rinvenuti a Cuma dal conte di Siracusa* (1853); *Pompeianarum Antiquitatum Historia* (1853); *Descrizione di Pompei* (1875).

FIORENTINO, fyō′rĕn-tē′nô, Francesco (1834–84). An Italian philosopher, born at Sambiase, Calabria, and educated at the University of Naples. After teaching philosophy at Spoleto he was appointed professor of that subject successively at the universities of Bologna, Naples, Pisa, and again at Naples. He was long a member of the Italian Parliament, was the editor of an edition of Giordano Bruno's *Opera Latina* (vols. i and ii, 1879–84), and published a large number of independent works, of which *Elementi di filosofia* and *Manuale di storia della filosofia* (Naples, 1879–81) deserve especial mention. He was Hegelian in his philosophical sympathies.

FIORENZO DI LORENZO, fyô-rĕn′tsô dē lô-rĕn′tsô (c.1440–1521). An Umbrian painter of the early Renaissance. He was born at Perugia, where most of his life was spent. The details of his life are uncertain, and critics differ concerning them. According to Berenson, he probably studied first under Benozzo Gozzoli and Niccolò da Foligno, then under Pollajuolo at Florence, and also owed much to Luca Signorelli. While under the influence of the Florentine masters he painted the eight fascinating panels of the "Miracles of San Bernardino" in the Perugia pinacotheca, which combine the charm and grace of the Umbrian school with the feeling for line and movement of the Florentine. A "Nativity" in the Perugia Gallery and an "Annunciation" in the Portuncula of Santa Maria degli Angeli, Assisi, also belong to this early period, and are marked by a sense of space and atmosphere and expressive characterization. Later his art greatly degenerated, the "Adoration of the Magi" in the Perugia Gallery being the only other work of real value which he

FIRS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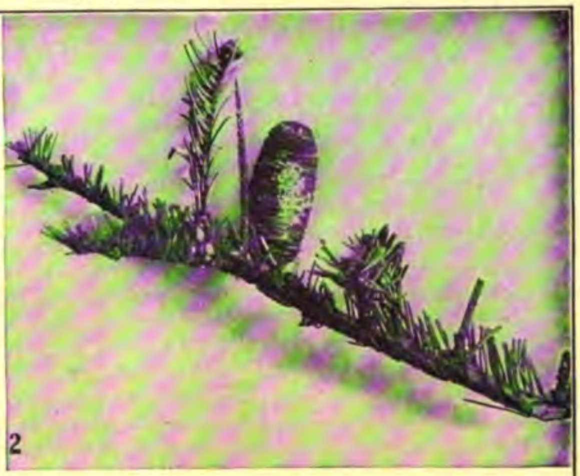
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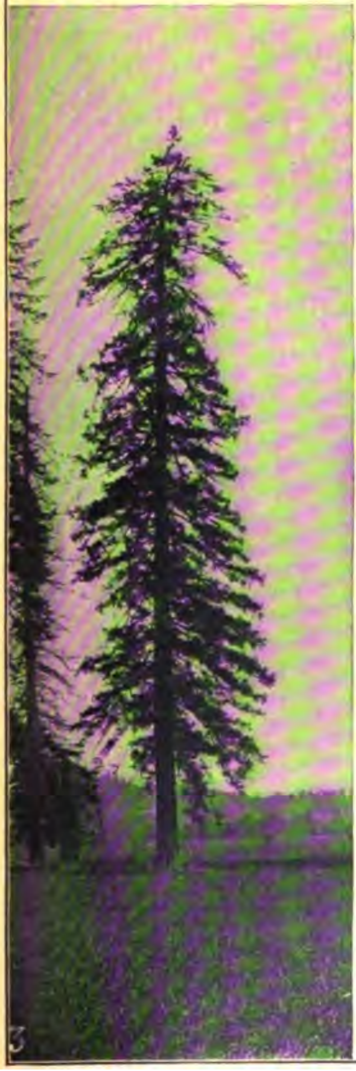
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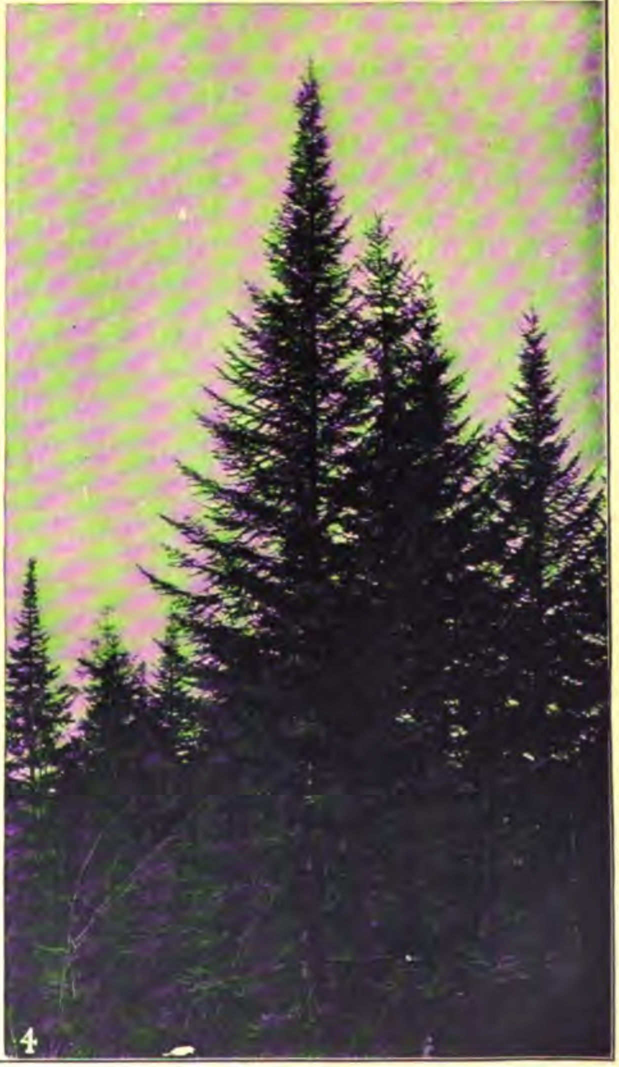
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1. WHITE FIR FEMALE FLOWERS.
2. WHITE FIR CONE.
3. WHITE FIR TREE (Abies grandis).
4. BALSAM FIR (Abies balsamea).

produced. Among the paintings ascribed to him are a "Madonna" (1481; Berlin Gallery), "Adoration of the Magi" (Pitti Gallery, Florence), and "St. Jerome" (Jarves collection, New Haven). His most famous pupils were Pinturicchio and Perugino. Consult Berenson, *Central Italian Painters of the Renaissance* (New York, 1908), and Graham, *The Problem of Fiorenzo di Lorenzo* (Perugia, 1903).

FI'ORIN. See Redtop Grass; Bent Grass.

FIORINI, fyô-rē̆'nê, Matteo (1827–1901). An Italian geographer, particularly distinguished as a historian of cartography. He was born at Felizzano (Alessandria) and became an hydraulic engineer in 1848. He lectured at the University of Turin from 1848 until 1860, when he was appointed professor of geodesy at the University of Bologna, with which institution he remained associated during the last 30 years of his life. In addition to numerous essays, he published the following works: *Le projezioni delle carte geografiche* (1881), still regarded as a standard work; *Le sfere cosmografiche e specialmente le sfere terrestri* (1894; Ger. trans. by S. Günther, 1895): *Sfere terrestri e celesti di autore italiano* (1899).

FIR (AS. *furh*, Icel. *fura*, OHG. *forha*, Ger. *Föhre;* ultimately connected with Lat. *quercus*, oak). The popular name applied to many coniferous trees of the genus *Abies*. This name has often been employed to embrace all the evergreen coniferous trees that have short, rigid leaves, occurring singly, scattered over the stems, as distinguished from the pines (*Pinus*), whose leaves are longer and usually occur in bundles of two to five or more, and from those conifers having small imbricate scalelike leaves, as arbor vitæ and various cedars. The name "fir" should be retained exclusively for species of the genus *Abies*, and the related trees should be called hemlock (*Tsuga*), spruce (*Picea*), etc. The species of *Abies* are mostly trees of pyramidal habit, with erect cones, maturing in one season. Their short leaves, arranged upon the horizontal branches in such a way as to appear to be two-ranked, are flattened, the midrib showing prominently upon the underside. There are about 25 species found throughout the cooler portions of the north temperate zone. One of the most common is the silver fir of Europe (*Abies pectinata*). It is a common tree in central Europe, attaining a height of 150 to 200 feet, with a basal diameter of six to eight feet. In some places it occurs over extensive tracts to the almost entire exclusion of other species. The wood, which is white, soft, of light weight, and contains little resin, is employed in many ways. The tree yields the Strassburg turpentine, which is a superior clear variety. Quite similar is the North American balsam fir (*Abies balsamea*). This species is found from Virginia northward. It attains a height of 50 to 80 feet; the wood is light and not durable. From it Canada balsam is obtained. Closely related to it is Fraser's fir (*Abies fraseri*), which is found farther south. This is a smaller tree, with smaller cones and differently shaped bracts. Upon the Pacific coast are a number of indigenous species of fir, the timber of which is very valuable. *Abies grandis*, which is found from British Columbia to Lower California, one of the finest trees of that region, is known as the great silver fir and attains a height of 300 feet and a diameter of 10 feet or more. The wood is white and soft and is extensively consumed for cooperage, boxes, etc. Closely related to it is the *Abies nobilis* of the same range, with much the same characteristics. Both species are highly valued in England as ornamentals, but they have not been extensively planted in the eastern United States. *Abies nordmanniana* of the Caucasus is one of the most hardy of all the species of fir. It is a tree that becomes 150 feet high, with a trunk diameter of 4 or 5 feet. It has been introduced for forest and windbreak planting in parts of the United States and has already proved one of the most valuable evergreens for such uses. The Mount Enos fir (*Abies cephalonica*) and the Spanish fir (*Abies pinsapo*) occur in the south of Europe, where they are trees 50 to 80 feet tall. Their timber is considered valuable. *Abies webbiana* occurs in the Himalaya Mountains at elevations from 7000 to 13,000 feet. It is a fine tree, growing to a height of 130 feet or more and a diameter of 8 to 10 feet. The wood is harder and heavier than that of most species of fir, contains more resin, and as timber is very valuable. In Mexico is found *Abies religiosa*, a magnificent silvery-leaved tree, which grows to a height of 150 feet and a diameter of 6 feet. It is well adapted to lath and shingle making. The boughs are extensively used as a church decoration. A number of other species attain the size of large trees, as *Abies venusta* of the Pacific coast, *Abies sibirica* of Siberia and Russia, *Abies cilicica* of Asia Minor, *Abies veitchii*, and *Abies homolepis* of Japan. Of many of the above enumerated species of *Abies* there are cultural varieties that differ in habit of branching, color of foliage, drooping habit, etc., some of them being very handsome ornamental trees. For accounts of the somewhat similar and formerly combined species of evergreen conifers, see Spruce; Hemlock.

FIRANDO. See Hirado.

FIRANGI, fê-rän'gê. An Eastern name for Europeans, whose land is called Firangistan. The name is supposed by some to be a corruption of Frank and to date from the Crusades, while by others it is derived from the Varangians (Warings), Norsemen who entered into the service of the Byzantine emperors at Constantinople. In Bengal the mixed descendants of the Portuguese, though differing in no respect but religion from the natives, are especially distinguished by the term *Firanghis*.

FIR'BOLGS. The name given in the fabulous history of Ireland to a tribe said to have descended from the Nemedians, who, under their leader Nemed, came to the island some 23 centuries before the Christian era. After remaining for about two centuries the greater part fled because of the oppression of Scandinavian pirates known as the Fomarians. The Nemedians formed three bands—one going to Scotland, another to a northern part of Europe, becoming the tuath (or tribe) De danann of a later period, and the third to Greece. The colony in Greece, or the Firbolgs, became restive under oppression and decided to return to Ireland, and under the rule of the five sons of Dela they enjoyed full possession of Ireland for something less than a century. Their kinsmen, the tuath De danann, also returned, and the Firbolgs were forced to consent to the partition of the land. Such was the condition of Ireland until the Milesians came. These had left Egypt for Spain and after subjugating the latter country had determined to conquer Ireland. They became masters of the island about 1700 B.C. According to Guest, *Origines Celticæ* (2 vols., London, 1883), Firbolgs is simply the Irish name for the Belgæ. See IRELAND.

FIRCKS, fẽrks, THEODOR VON, BARON (1812–72). A Russian-German author, born at Kalven, Courland, and known under the pseudonym Schédo-Ferroti. He became an officer in the engineering corps of the Russian army and supervised the building of Russia's southern railroad lines. His sojourn in this region led him to write his *Lettres sur les chemins de fer en Russie* (1858). Subsequently becoming Russian diplomatic agent at Brussels, he was dismissed in consequence of his publication of a brochure in favor of the Polish cause entitled *Lettre d'un patriote polonais au gouvernement national de la Pologne* (1863). His most important work, *Etudes sur l'avenir de la Russie* (1858–68), his *Lettres sur l'instruction populaire en Russie* (1869), and *Die internationale Arbeiterbewegung* (1872) made him in his time a very influential writer in the domain of Russian politics.

FIRDAUSĪ, fẽr'dou-sē', or **FIRDUSI**, fẽr'-dōō-sē', ABU'L QASIM MANSUR, or AHMAD, or HASAN (c.935–1020 or 1025). The greatest epic poet of Persia and one of the foremost in all literature. He was born in Tūs in Khorassan about 323 A.H. (935 A.D.). The name of his father is quite unknown, but he seems to have been a man who lived in very comfortable circumstances and one of the Dihqân, or landed gentry. The best account of the poet's life is given by 'Arudī, of Samarkand, who visited Tūs about a century after the death of Firdausi. This record is preserved by Ibn Isfandiyâr in his chronicles of Tabaristan (the passage is published by Ethé in vol. xl of the *Journal of the German Oriental Society*). At the age of 28 Firdausi married, and of the two children born to him, one, a daughter, survived her father. When the poet was about 36, he began the work by which he is best known, the *Shāh-Nāmah*, or Book of Kings, which occupied him for 35 years, and of which he completed the first edition in 1010, when he was about 80 years of age. Other Persian poets had tried their hand at the theme before him, for the remembrance of their own Iranian history was preserved despite the conquest of Islam. Of these predecessors the most noteworthy was Daqīqī, who flourished in the tenth century A.D. His work, placed in Firdausi's hand by his compatriot, Mohammed Laskbari, formed the nucleus of the *Shāh-Nāmah*.

This great Book of Kings traces the history of Persia from the mythical ruler Gayumart, who lived, according to Iranian tradition, about 3600 B.C., to the Mohammedan conquest in 641 A.D.

The poem, which according to Firdausi's own account contains 60,000 couplets, or more than seven times the amount of the *Iliad*, treats first of the legendary kings of Iran, Gayumart, Hoshang, Tahmuras, and Jamshid, who was the most famous of them all, and reigned 500 years during the golden age of the earth. Following this happy period came the evil rule of the Arab Dahhâk, or Zohak, who was tempted by Ahriman, his own ancestor, and fell into sin, increasing his evil until the smith Kavah set up his leathern apron, as the banner of revolt, and Fredun (Farīdūn), the Thrætaona of the Avesta, came and bound the tyrant and confined him beneath Mount Demavend on the shores of the Caspian. The reign of Fredun was a long one, but its close was darkened by the strife of his three sons, among whom he had divided the kingdom. He was succeeded by Minochihr. At this point in the poem there is inserted an episode of considerable beauty which recounts the loves of Zal, of the royal line of Iran, and Rudabah, the daughter of the King of Kabul, whose union was blessed by the birth of the most romantic of all the heroes of the *Shāh-Nāmah*, Rustam, who occupies a position in Iranian legend somewhat analogous to that of Hercules in the classic literatures. It was Rustam who during the reign of Kaus won Mazanderan for the Persian King and performed seven romantic and perilous quests before he could succeed. It was he, too, who in combat unwittingly slew his own son Suhrab, who, ignorant of his paternity, was fighting among the foes of Iran. Later Rustam again invaded Turan to revenge the murder of Syavush, a son of Kaus. He fought also with Firud, King of India, and with the powerful Turanian ruler Kamus. From this time on until the dawn of the historical period, the *Shāh-Nāmah* is occupied mainly with accounts of the wars between the Iranians and their hereditary foes, the Turanians. With the opening of the reign of Gushtasp there is an episode of extreme importance giving an account of Zardusht, or Zoroaster (q.v.). The interest of the epic, which was slightly less during the reigns of Khusrav and Lohrasp, now revives, and it is continued by the legend of the seven adventures of Isfandiyar, the son of Gushtasp. The father's jealousy of his son, however, caused Isfandiyar to be imprisoned, until his aid against the Turanian Arjasp became indispensable. Then he was released, but as soon as possible was sent by Gushtasp on further adventures and at last was craftily matched in a duel with Rustam, by whom the younger hero was slain, while Rustam himself soon afterward fell in battle. It is noteworthy that there is no mention in the *Shāh-Nāmah* of the Achæmanian kings, a fact which is not as yet altogether satisfactorily explained. Of the Arsacidæ Firdausi knows only the names. The history takes a sudden leap to the Sassanidæ (q.v.). According to the *Shāh-Nāmah* Gushtasp was followed by Bahman and his son Dara (Darius), who married a daughter of the Emperor of Rum (Byzantium). This princess, who was soon divorced by Dara, gave birth at Byzantium to Iskandar, or Alexander the Great (q.v.). The remainder of the epic, excepting for the long account of the reign of Bahram Gor, is of less interest. It traces with a fairly close adherence to history the reigns of the Sassanian kings down to the defeat and death of Yezdegird III (641 A.D.). Yet there are interwoven in this latter part of the epic, and elsewhere, numerous episodes of much interest. Among these may be noted the story of the seven banquets of Nushirvan with the sages, of whom he inquires concerning a mysterious dream, the introduction of chess from India into Persia during the reign of the same monarch, and the story of the loves of King Khosru Parviz and Queen Shirin.

Thus we have a valuable source for the early history of Iran, which is needed to supplement the accounts given in the Old Persian cuneiform inscriptions and the Avesta (q.v.). It would seem that Firdausi had a distinctly patriotic motive in writing the *Shāh-Nāmah* in addition to his poetic and historical incentives. He plainly desired to keep alive in the hearts of the Persians the glories of their ancestors' deeds and faith in order that they might not become mere puppets under Arab domination. This is shown not alone by the theme and spirit of the epic, but even by the diction employed. While it is considered a mark of elegance in other Persian poetry to employ as large an element of Arabic as possible, Firdausi rigorously adheres throughout to the native Persian vocabulary, and the percentage of Arabic words in his work is extremely low. The poem flows on in a dignified style, without the excess of coloring or the straining after effect which is often found in Oriental poetry.

The epic as a whole is dedicated to Mahmud of Ghazni (see GHAZNIVIDES), to whose court Firdausi went to present his work as the tribute of a poet of fame. Meagre was his reward from the parvenu Turk; at most the sum was not more than 20,000 dihrams (about $2400). The disappointed poet found revenge in a bitter satire on Mahmud, which he substituted for his former eulogies of the Sultan. Firdausi then fled to Herat, and thence to Tabaristan, where the Prince, Ispahbadh Shahryar, protected him and counseled him to withdraw the offensive verses against Mahmud. This advice was followed, and it would seem, from the poet's later history, that the lampoon never reached the Sultan. Firdausi is next found living under the protection of one of the princes of the house of Buwayh, for whom he composed a romantic epopee of 9000 couplets on the loves of Yusuf and Zulaykhā, the Arabic version of the biblical story of Joseph and Potiphar's wife, a favorite theme of Oriental poets. In his old age Firdausi returned to his native town of Tūs. There is a tradition that Mahmud at last forgave the poet for his satire, and sent him a present of 60,000 dihrams (about $7200). A portion of this may well be true. At all events, we know that he died in peace, probably in 411 A.H. (1020 A.D) or even later (about 1025 A.D.). About the name of Firdausi, as of many other great authors, a number of poetic legends have gathered. As an example, may be mentioned the story that Mahmud's gift of favor came at the moment when the body of the poet was being carried to its final resting place.

Bibliography. Editions of the *Shāh-Nāmah* have been published by Macan (4 vols., Calcutta, 1822–29); Mohl (6 vols., Paris, 1831–68); Vullers and Landauer (3 vols., incomplete, (Leyden, 1877–84); translations by Mohl (7 vols., Paris, 1876–78); Rückert (incomplete, Berlin, 1890); Pizzi (8 vols., Turin, 1886–88); A. G. Warner and E. Warner (in blank verse, 6 vols., London, 1905–12); Schack, selections (3 vols., Stuttgart, 1877); Modi (trans. into Gujarati, 1904); Rogers (London, 1907); Modi, *Episodes from the Shāh-Nāmah* (2 vols., Bombay, 1906–07); *Episodes of the Famous Women of the Shāh-Nāmah* (ib., 1908). There is an abridgment in English by Atkinson (London, 1832; reprinted New York and London, 1886) and by A. Rogers (London, 1907), and a sketch of the *Shāh-Nāmah* in Reed's *Persian Literature* (Chicago, 1893). A critical edition of the *Yūsuf u Zalikhā* was published by Ethé (Oxford, 1908), and the poem has been translated by Schlechta-Wsschrd (Vienna, 1889). For further information consult: Nöldeke, in *Grundriss der iranischen Philologie*, ii (Strassburg, 1896–1904); Horn, *Geschichte der persischen Litteratur* (Leipzig, 1901); Browne, *A Literary History of Persia* (New York, 1902–06), and the authorities referred to there.

FIRE. The discharge of firearms, as the *fire* of the enemy, *broadside fire*, etc. *Bow fire* includes the fire of all pieces of a ship which are so mounted as to be able to fire directly ahead; *stern fire*, that of all pieces which can fire directly astern; *broadside fire*, all which can fire abeam. A *raking fire* is one so delivered that the projectiles pass through a vessel in a fore-and-aft direction, or nearly so. A *plunging fire* is one directed downward from an elevation; if directed at a vessel, such a fire would pierce her decks. *Direct fire* is used when the gun is aimed so that the projectile will hit by direct impact. *Ricochet fire*, much used in the days of spherical projectiles, consisted in firing at a short range and allowing the shell to ricochet, or be reflected from the surface of the water, once or twice before reaching the object aimed at. Elongated projectiles from rifled guns ricochet in a very irregular manner, usually turning sharply to the right and oftentimes rising at a considerable angle after meeting the water; this behavior of rifle shell has caused the discontinuance of ricochet fire. *High angle, mortar*, or *howitzer fire* is effected by elevating the piece at angles of 30° or more above the horizontal and effecting a hit by dropping upon the object. The same effect is obtained by *curved fire* from ordinary guns, which is brought about by extra elevation and a reduction of the powder charge. Both kinds of fire are used to reach objects over other higher ones which intervene. See GUNNERY; MORTAR; ARTILLERY; BALLISTICS; TARGET PRACTICE.

FIRE, ORDEAL BY. See ORDEAL.

FIRE, PRIMITIVE. The conception of early man as a fireless animal has been entertained from remote times, and the prevalence of this idea in origin myths seems to present a real survival in lore from the primitive period. This great body of lore with attendant customs clearly points out the stages in man's progress by which fire from an unused and almost unknown force became interwoven with his life as a prime necessity. These stages represent: (1) man in the same case with his feral neighbors as to fire, but having a clearer knowledge of its manifestations in the lightning, volcanoes, and other exhibitions in nature (stages of the knowledge of fire); (2) from some of these sources fire is acquired and preserved for the most primitive use conceivable, perhaps for protection from the beasts (stage of acquisition and preservation of fire); and (3) the stage marked by the invention of a process of creating fire at will, either by friction of wood in the fire drill, fire plow, and fire saw, or by the percussion of minerals in the flint and pyrites (stage of fire producing). Growing out of these great strides in man's progress comes the fourth stage, marked by an increasing utilization of this element down to the present (stage of the conquest of fire).

It will be seen that, in respect to the distribution of mankind over the earth, fire has played the leading part. In the first stage, before the use of fire, the distribution of man fell under the laws regulating the movements of animals. In the second stage, with the preservation of fire, man became sedentary and aggregated into groups having the germs of the state. In the third stage, with the means of providing fire at will, fire preservation sank into a lower place, and man became free to immigrate into different zones. With the cumulative employment of fire in the mechanical era, there enters a time element, and great masses of humanity move quickly to settle the waste places of the earth where before the movement was slow. From this most fertile of beginnings in the camp fire have grown a great majority of the arts that have supplied man's artificial wants—those primary arts represented by lighting, cooking, offense, and defense; and those secondary arts connected with the mechanics of fire or its use in agriculture, timbering, boat building, metallurgy, ceramics, etc., all with vast ramifications. There is also a social history of fire, a mythology embracing the various phases of fire worship with its ceremonies and observances, and a folklore of magnitude and surpassing interest. Consult: Tylor, *Researches into the Early History of Mankind*, pp. 229 et seq. (New York, 1905); Hough, *Smithsonian Report*, 1888, part ii, pp. 531–587; id., 1890, pp. 395–409.

FIRE, SAINT ANTHONY'S. See ERYSIPELAS.

FIRE ALARM. A fire-alarm system consists of a telegraph signaling equipment with a network of wires running from a main office, or fully equipped central station, to all parts of a city or district, and provided with signal boxes conveniently placed and accessible, from which alarm signals may be sent to the fire department by any one without special knowledge of the instruments, simply by turning a crank or pulling a hook. Each fire-alarm box or street-signaling station contains a transmitter or device to make and break an electric circuit. The earliest box, first used at Boston, Mass., in 1851, contained merely a form of telegraph key controlled by a revolving wheel which gave a certain number of signals when the person sending the alarm turned the crank "six times slowly," as the directions indicated. In its simplest form and essential characteristics a fire-alarm signal box may be described as follows: A metallic wheel is provided with teeth or notches, the spaces between which may be filled with some nonconducting substance; a contact spring or follower rests against the wheel and, as the wheel is turned, touches in succession the projecting teeth, closing and opening the circuit at each tooth and causing a signal at the central office, or, in small towns where there is no central office, at all the engine houses or alarm stations, such as tower-bell mechanisms, connected on the electric circuits of the system. If the arrangement on the wheel should be two teeth, a space, three teeth, a space, and two teeth, followed by a long space, one rotation of the wheel would give two signals, then three, then two, or the number 232, and this number would be repeated as often as the wheel is rotated. The wheel may be turned by a crank or, after being released, automatically by a spring and clockwork; in the latter case, once started it cannot be stopped until the total number of revolutions for which it is set and wound have been made. There is often provided an inner box, to which the firemen alone have keys, which contains telegraph instruments for use in communicating with headquarters, by means of which the officer in charge is enabled to give information and call for such extra and special supplies as are needed or signal the extinguishing of the fire. The outer doors of fire-alarm boxes at one time could be opened only with keys intrusted to citizens, the nearest resident, the police, etc., but now automatic doors for alarm boxes are more generally used. These may be opened either with a key accessible by breaking or removing a small piece of glass or without a key by simply twisting the door handle. The signal from the box may be received upon a common Morse recording instrument, or on a special form of recorder, and registered on a strip of paper as well as shown by an indicator. Both the time of its receipt at and transmission from the central station may be recorded by pens on a revolving paper roll or appropriate printing register. Through the agency of a sensitive relay and a secondary circuit which may be employed also to ring tower bells and sound steam-whistle alarms, automatic apparatus transmitting the alarm to the appropriate fire companies may be set in operation.

Historical Sketch. Methods of transmitting news of outbreaks of fire are very old, and even until about the middle of the nineteenth century watch towers with alarm bells were maintained in American cities, but the perfection of the electric telegraph was essential to the development of instantaneous and reliable apparatus, which soon became largely automatic. As early as 1845 Dr. W. F. Channing, of Boston, published an article in the *Advertiser* of that city, outlining a fire-alarm telegraph system. In 1850 Charles Robinson used Morse apparatus for signaling fire alarms from police stations and engine houses in New York City to watchmen at tower bells who sounded the signal of the appropriate district. In 1851 the city of Boston appropriated $10,000 for testing a telegraph-signal plan, and it was put into operation on April 29, 1852. Dr. Channing and Moses G. Farmer developed the system, which was constructed for Boston by Mr. Farmer and operated under his direction for several years. In 1857 these men patented the system as developed. John N. Gamewell became interested in the matter in 1855 and by 1869 had acquired the patent rights. Subsequently he did much to improve and introduce the system; but the Civil War, conservatism, and other obstacles were sufficient to prevent its introduction in more than some 20 cities by 1871. New York installed a fire-alarm telegraph system in 1869, but has never maintained or equipped this department on a scale commensurate with its other fire apparatus.

In 1875 the number of cities using the fire telegraph system was 75, and since then the increase has been rapid, so that to-day most towns of 10,000 population or over, and many smaller ones, have the fire-alarm telegraph. Although various systems are in use, that devised by Channing and Farmer, and developed and improved by Gamewell and his associates and successors, has been the one most generally employed in America. In 1867 the "noninterfering pull" was patented by C. J. Chester, and in 1880 a noninterfering box was patented by James M. Gardiner. In 1889 J. J. Ruddick patented the "successive" feature, whereby signals from two or more boxes on the circuit pulled simultaneously were recorded. The keyless door was patented by Tooker in 1875 and the automatic keyless door by N. H. Suren in 1895.

In this the gong was not sounded until the mechanism of the box was started.

The simple mechanism described in outline above would be found in what is known as a plain, or interfering box, the simplest type of the signaling apparatus. A number of these can be grouped on a single circuit, but it is obvious that if two boxes were put in operation simultaneously the signals would interfere and would not be properly received and recorded at the central station. Accordingly noninterfering boxes were developed where such a condition may be obviated by the selection of one box to transmit a complete and definite signal and by the temporary cutting out of circuit of any other box or boxes whose signals might interfere and come to the receiving mechanism blurred or confused. This noninterfering feature has been combined with what is termed a successive type of fire-alarm box where definite independent signals may be transmitted from a number of boxes operated at or about the same time without the loss of a signal from any of the boxes, one set of signals following another as soon as its determined number of rounds are completed and the circuit is free, so that both are received and recorded. The importance of this is realized when it is considered that the circuit loops often contain as many as 20 or more different boxes, even 50 boxes under very unfavorable conditions, in order to economize the wire circuits, and by a so-called interlacing system the alarm boxes are distributed as widely as possible. This, however, is not good practice, and from 7 to 12 boxes on a circuit are more desirable. In 1913, in New York City, a new type of box was evolved which contained the essential features of the successive and noninterfering box, the basic patents of which had expired, with an apparatus that provided for an automatic return through the ground in case of failure or defect to the circuit that under the older system would have impaired the usefulness of the circuit. Such a box permitted the use of the portion of the circuit that was intact and used the ground for a return, at the same time giving a signal to the operator, who automatically could switch into the circuit a powerful battery which would insure the proper transmission of the alarm. The best systems work on a closed-battery circuit, and it is possible to detect at once any failures or defects, and the signals are indicated at headquarters through an automatic recorder and an indicator on which the number of the box is displayed.

On receiving the signal at the central station or fire headquarters, it may be transmitted to the various engine houses automatically in the case of a small city, or manually, by means of an appropriate transmission apparatus and series of independent circuits. The automatic apparatus is connected by means of a system of relays or repeaters, so that the signals go out practically instantaneously to all the engine houses and are given on the large gongs and the indicators at each station, the various companies due to answer the various alarms proceeding in the usual way. A second signal follows on a yoker or independent circuit. The automatic repeating of every alarm to each company, whether due at the station sounded or not, would be confusing and unnecessary in a large city, so an operator or semiautomatic system is usually employed. In the manual form of transmission, as soon as the station from which the alarm is received is indicated, the operator takes from a cabinet a disk appropriately notched on its edge and attaches this to the transmission mechanism sending out a signal over the appropriate circuits, which may include every company in the city or only those in a selected district. In some departments the alarm is sent to every company, and the men and apparatus, whether due to respond or not, take their places in readiness to answer the alarm. In other instances, and often at night, the signals are sent only to the companies in a district directly affected. Where there are two independent circuits running from headquarters to the various fire companies it is not infrequent that before the second set of signals has been sounded tho company is on its way to the alarm. The equipment at the individual fire houses consists of the bell and gong of the two circuits, an indicator, a recorder, a clock, and various local circuits which release the horses from their stalls, open the doors, and turn on the lights, so that no time is lost. The fire departments of most American cities have, in addition, an elaborate telephone equipment maintained usually in connection with, or by, the local telephone companies, and communication is maintained between the engine house and fire headquarters, so that when the company answers the alarm its absence from its house may be reported immediately, and arrangements made for protecting the district should a second alarm be turned in. These telephone systems, often with auxiliary department switchboards, are maintained as a reserve in case of accident to or failure of the alarm system and under ordinary circumstances to supplement it.

For many years gravity cells were used to supply current to the various circuits, but in all important central stations they have been supplanted by storage batteries which are charged and furnish current at the desired potential. The fire circuits in most cities of any size are now placed underground, and while there is secured increased safety from interruption by weather conditions, such as sleet and ice, there is also the danger of interference due to high-tension circuits for power. For such protection, as well as protection from lightning, elaborate lightning arresters are required, and constant improvements are being made in apparatus of this kind.

An important side of the fire-alarm system is in connection with the protection of large public and other schools. In America fire drills have been developed to a high degree of efficiency, thus preventing panics and loss of life which are apt to occur at an outbreak of fire where a large number of children or other persons, such as factory operatives, are concentrated in limited space. For schools and factories fire-alarm systems have been developed where the sending of an alarm from a certain box causes bells to be sounded, at which ranks are formed and an orderly march is made to previously determined exits. These alarm boxes may communicate with the superintendent's or principal's office in the building and with the local fire department and police stations, and often are arranged so that they may be sounded for purposes of drill without actually bringing out the apparatus.

In connection with city fire-alarm systems various automatic and private alarm systems are installed in public buildings and on the premises of those requiring or desiring such special protection. These may involve a system of small call boxes located as frequently as desired and connected with the nearest street alarm box, whose mechanism is set in operation by the signal made within the building. Often these small boxes have a glass face which can be broken and the mechanism set in operation by pulling a chain or turning a key. In other cases some form of automatic or thermostatic fire detectors may be employed where an increase in temperature causes the device to operate and the signal to be transmitted to the local headquarters of the fire-alarm service company, as well as ringing a gong on the premises, with possibly a return signal indicating that the alarm has been received. This may result in an immediate examination of the premises from which the signal is indicated, or, in addition, a signal may be sent to fire headquarters, and not only the employees of the alarm service company, but the city fire department will answer as in the case of a regular alarm.

In many cases where a building is protected by automatic sprinklers the operation of these sprinklers and the discharge of water is also sufficient to send in an alarm, either to the fire-alarm company or directly to the fire department. For further information, consult publications of the National Board of Fire Underwriters, catalogues of leading manufacturers, and chapter on "Fire Alarm Telegraph," in Maver, *American Telegraphy* (New York, 1903).

FIREARM. A device consisting essentially of a straight tube, provided with means of igniting the charge, which projects a mass of metal or other material through the force of the expanding gases developed by the burning of a charge of gunpowder. It is said that some sort of firearm in which stones were used as projectiles was in use by the Chinese in the eighth century, but this and other legends ascribing even an earlier date are of doubtful character. However, there is some proof that at the beginning of the thirteenth century firearms were possessed by the Mongols and that Genghis Khan used them in 1258. The Mohammedan powers, then in the height of their development as regards science and art, seem to have been familiar with the use of firearms in the twelfth century and had developed practicable small arms in the thirteenth. There is some probability that the early form of small cannon used in western Asia and in Europe was derived from the tubes set in the bows of galleys for discharging Greek fire (q.v.) upon the decks of the enemy at the moment of ramming. Greek fire contained the essential ingredients of gunpowder and was very explosive if confined. Early in the fourteenth century cannon came into general use in Europe, and by the end of that century cannon and small arms had become common. See ARTILLERY; BALLISTICS; GUNNERY; GUNPOWDER; ORDNANCE; SMALL ARMS; GUNS, NAVAL.

FIREBACK. A pheasant of the Malayan genera *Lophura* and *Acomus*, in which all the species have metallic plumage on the back. See PHEASANT.

FIREBALL. A projectile designed, when discharged from gun or mortar, to set fire to an enemy's defensive works or for giving illumination during operations against him. Fireballs were the successors to the fire arrow of ancient warfare and have in turn been superseded by the rocket and the incendiary shell. See AËROLITE.

FIRE-BELLIED FROG. See FEUERKRÖTE.

FIREBILL. A paper giving in detail the stations and duties of officers and men of a vessel of war upon the alarm of fire. When the crew of a ship are at their stations as defined in the fire bill, the gathering is known as *fire quarters*. All precautions are taken against fire, and pumps, hose, and extinguishers are prepared for use.

FIREBIRD. See TANAGER.

FIRE BLIGHT, or **PEAR BLIGHT.** One of the most destructive diseases of pears, apples, and other pomaceous fruits. While not as regular in its attack as some other plant diseases, no other is more destructive when it does appear. Fire blight is a contagious bacterial disease due to *Bacillus amylovorus*, which gains entrance through the soft tissues of new growth such as twigs and young fruits, through wounds made by insects or otherwise, but especially through the nectaries and stigmatic surfaces of the blossom, from which point of infection the bacteria rapidly spread, killing the tissues as they progress. The leaves are sometimes attacked, but usually they die as a result of the destruction of the twigs, and they remain dried and attached to the branches, forming one of the most striking features of the disease. The part attacked is the cambial layer of the twigs, down which the disease passes to the branches, and finally to the trunk, forming distinct cankers which are often the source of new infections. Its rate of progress is not very rapid, and, when it has run its course, the line of demarcation between sound and dead wood is easily seen. Upon bearing trees the first place of attack is usually in the blossoms, the germs being spread from flower to flower and from tree to tree by bees and other insects. The disease may be recognized by clusters of blossoms turning black. From these the disease spreads. It seems to winter over in infections that have occurred late in the summer. The infected bark is moist, and in the spring gum exudes from the diseased area. This is especially attractive to bees, which carry the germs from the gum to the flowers. Rapid growth of the trees, which may be caused by severe pruning or by too much nitrogenous food in the soil, favors the spread of the disease. Anything that will check the growth of the trees, such as withholding cultivation and nitrogenous fertilizers, should be adopted. The most satisfactory treatment is to cut out and burn all blighted limbs while the trees are dormant. All parts suspected of infection should be carefully examined and severely pruned back six inches or a foot below the line of separation between sound and diseased wood. The best time to do this is in the autumn, when the contrast between the diseased and the sound branches is most striking. A careful inspection of the trees should be made several times during the summer, and all new infections should be cut out and burned. If all pear, apple, quince, crab, hawthorn, and allied plants be looked after in this way, the serious spread of the disease may to a great degree be prevented.

Fire blight is one of the first demonstrated diseases of plants due to bacteria. Its cause was discovered by Dr. T. J. Burrill, of the University of Illinois, about 1879. It has spread widely in the United States, and in 1913 it was reported in Europe. In addition to species of pomaceous plants, it is now known to attack plum trees. Different varieties of pears, apples, etc., vary widely in susceptibility to this blight, and those least subject to it should be given preference in planting.

FIRE BOAT. See FIRE ENGINE.

FIRE BOTE. See ESTOVER.

FIRE BRICK. A brick made of clay capable of standing a high degree of heat—not less than 2700° F. Fire bricks are made in various sizes and shapes and are required for the lining of furnaces, and for various receptacles used for the treatment of raw materials by heat, such as the smelting and refining of ores, also in the clay industry for brick and pottery kilns, and for the manufacture of Portland cement, and in coking. Naturally the essential element in the composition and manufacture of fire brick is fire clay, and where considerable deposits of this substance are found, works for making fire brick are often located. Fire clays usually contain small amounts of fluxing materials, and ordinarily are classed as flint clay and plastic clay, the former containing a large percentage of kaolin, and possessing a greater amount of refractoriness, though often flint clay is mixed with the plastic clay which increases the deformability. In making fire brick various crushed silica rocks and other materials may be mixed with fire clay or lime in order to obtain a product suitable for the work in hand. The actual manufacture of fire brick is quite similar to that of common brick. The mixture of plastic fire clay with the other materials is the first stage, and it is finally ground in a dry pan or disintegrator. It is then screened and tempered in a pug mill, after which it is molded and dried, and then repressed and burned. The burning takes place usually in a down draft kiln at a temperature ranging from 2250° F. to 2700° F. Sometimes, however, an up-draft kiln may be used (see KILN). In the United States New Jersey was the first State to produce fire brick, the industry being established there in 1812, and since that time it has spread widely, many States producing fire clay in greater or less amount. The increase has come largely with the growth of metallurgical processes, particularly the vast development of the iron and steel industry (see IRON AND STEEL, *Metallurgy of*). In the actual manufacture of fire brick there is little variation from ordinary brick processes, but the composition of the resulting product has received considerable attention, owing to its effect on the process. The general nature of working will be found discussed under BRICK and CLAY, while the construction of various furnaces for metallurgical work is described under IRON AND STEEL. A valuable technical work of reference is Havard, *Refractories and Furnaces* (New York, 1912). Consult also Kanolt, "Melting Points of Fire Bricks," *Technological Paper, No. 10*, United States Bureau of Standards (Washington, 1912), and Ries and Leighton, *History of the Clay-Working Industries in the United States* (New York, 1909).

FIRE CLAY. A variety of clay capable of withstanding a high degree of heat, but varying otherwise in its physical properties. This is because it contains a low percentage of fluxing impurities such as iron, lime, magnesia, and alkalies. A good fire clay should resist a temperature of 2900° F., and some will resist 3500°; but unfortunately many clays are called fire clays which are not really refractory. Fire clays are often plastic, but in the United States especially there exists a nonplastic variety known as "flint clay." Fire clay is found in many sedimentary formations, and in the Carboniferous rocks may be associated with coal, but all clays under coal are not fire clays. In the United States it is found in the Carboniferous rocks of Pennsylvania, Ohio, Missouri, and Kentucky; in the Cretaceous of New Jersey and other States, especially Colorado; and in the Tertiary of the Gulf States, Tennessee, Kentucky, and California. Large quantities are obtained in Germany, England, France, Belgium, Austria, and Russia. Some of the German and Belgian clay is exported to the United States. Deposits are also known in the Dirt Hills, Saskatchewan, and Sumas Mountain, British Columbia.

The following analyses give the composition of some American and European fire clays:

CONTENTS	1	2	3	4	5
Silica	52.58	52.52	46.88	49.75	64.10
Alumina	33.12	31.84	35.42	35.83	22.22
Ferric oxide	.20	.67	1.74	.77	1.92
Lime	....	.27	.44	....	.14
Magnesia	.29	Trace	.20	.11	.18
Alkalies	.08	Trace	1.19	.44	1.10
Water	13.68	14.23	14.10	13.70	7.10
Titanic acid	....	....	....	1.10	1.00

1. Flint clay, Hunker Station, Pa. 2. Flint clay, Mineral Point, Ohio. 3. Golden, Colo. 4. Woodbridge, N. J. 5. Stourbridge, England.

Fire clays are used in the manufacture of fire bricks, gas retorts, glass pots, assayers' furnaces, crucibles, and other objects which in their use are subjected to a high degree of heat, but their value for one or the other of these purposes depends on various physical properties in addition to refractoriness.

Among the varieties recognized are: *flint clay*, a hard form, resembling flint in appearance and lacking plasticity, found in the same bed with plastic clay; *ganister*, a refractory clay having a high percentage of silica; *pot clay*, a fire clay burning dense at a low red heat, but otherwise refractory, used in the manufacture of glass pots; *fire mortar*, a sandy fire clay used for making mortar to set fire bricks; *retort clay*, a very plastic refractory clay used in the manufacture of gas retorts. The fire clay produced in the United States in 1912 amounted to 1,695,337 short tons, valued at $2,363,357. Consult Bischof, *Die feuerfesten Thone* (Leipzig, 1895), and Ries, *Clays: Occurrence, Properties, and Uses* (New York, 1908). See CLAY; COAL; AMBOY CLAYS.

FIRE CREST. A British kinglet (*Regulus ignicapillus*), more fully called "fire-crested wren" and also "goldcrest." See KINGLET.

FIRE DAMP. An explosive mixture of marsh gas (carburetted hydrogen, CH_4) and air. The specific gravity of the mixture being lighter than air, the fire damp is looked for in cavities of the roof and the higher working places of the mine. Under ordinary conditions, when 1 part of marsh gas mixes with 5½ parts of air, the combination is at its lowest explosive limit. This explosive violence increases with the addition of air and reaches its maximum when a mixture of 1 part of marsh gas and 9½ parts of air is reached; beyond this point the explosive violence decreases and becomes inert when a mixture of 1 of marsh gas and 13 of air is reached. An increase in atmospheric pressure will extend these limits. WHITE DAMP is carbon monoxide (CO); BLACK DAMP is carbon dioxide (CO_2); STINK DAMP, or sulphur gas, is hydrogen sulphide (H_2S), and AFTERDAMP is the mixture of gases formed by an explosion. See MINE GAS; METHANE.

FIRE DANCES. Dances performed around the fire, generally at night. Fire is almost universally associated with the home and hence with the family, and in the course of religious evolution the fire dance has gradually gained in importance. Whereas in Vedic India, e.g., we find the rite as a fertility charm performed at the solstice, among the American Indians it has developed into forms of war dances, of which the most important is the scalp dance. In Australia the Corroboree, performed in elaborate costumes, marks a further step towards the purely mimetic dance and prepares the way for pantomimic drama, the earliest form of the art as it is found among the aborigines of that continent. Rising higher in the art scale, the fire dance becomes a simple recreation of more or less elaborate character, as is typified in dances around ordinary bonfires. A highly developed form of the fire dance exists on the modern stage where the firelight is represented by calciums of different colors. See FIRE WORSHIP; SKIRT DANCES.

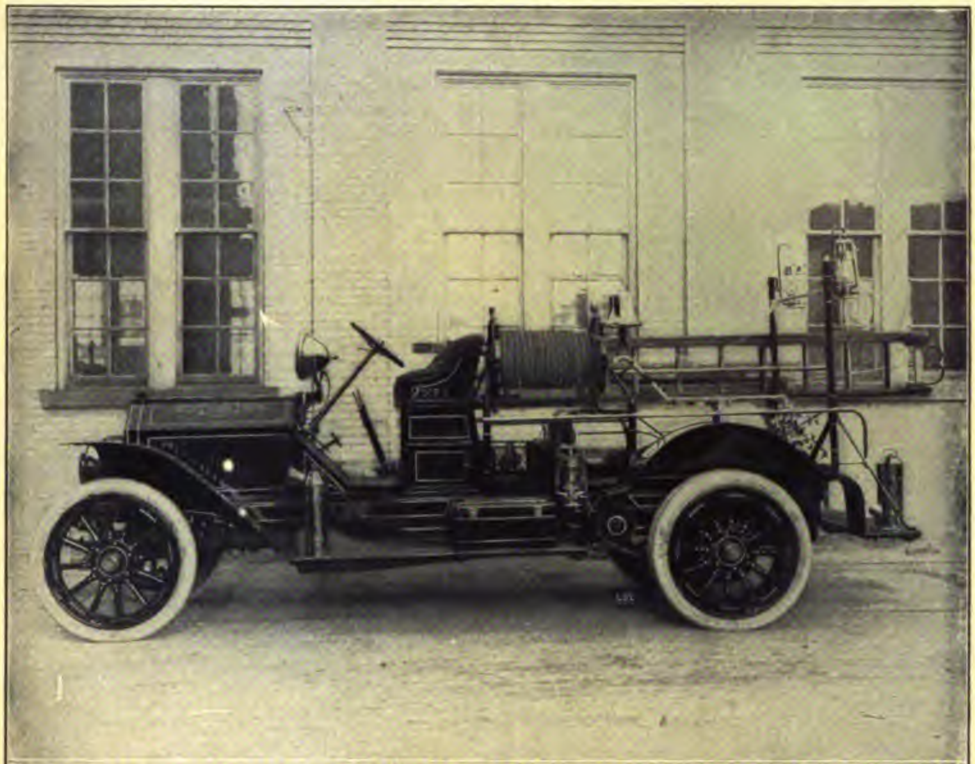
FIRE EATING. A name usually given to a variety of feats performed by jugglers with flaming substances, melted lead, red-hot metal, etc. Many feats of this kind are undoubtedly mere tricks, or illusions, produced by sleight of hand; others are capable of scientific explanation. There is nothing more wonderful in stuffing blazing tow into the mouth—a common form of mountebank fire eating—than in eating flaming plum pudding, or in dipping a finger into spirits and letting it burn like a candle. It is well known, too, that the tongue or the hand, dipped in water, may be rubbed with impunity against a white-hot bar of iron; the layer of vapor developing between the hot metal and the skin prevents contact and produces coolness. Certain kinds of these performances are explained by the well-known power of the living body to maintain its normal temperature for a time, independently of the external temperature.

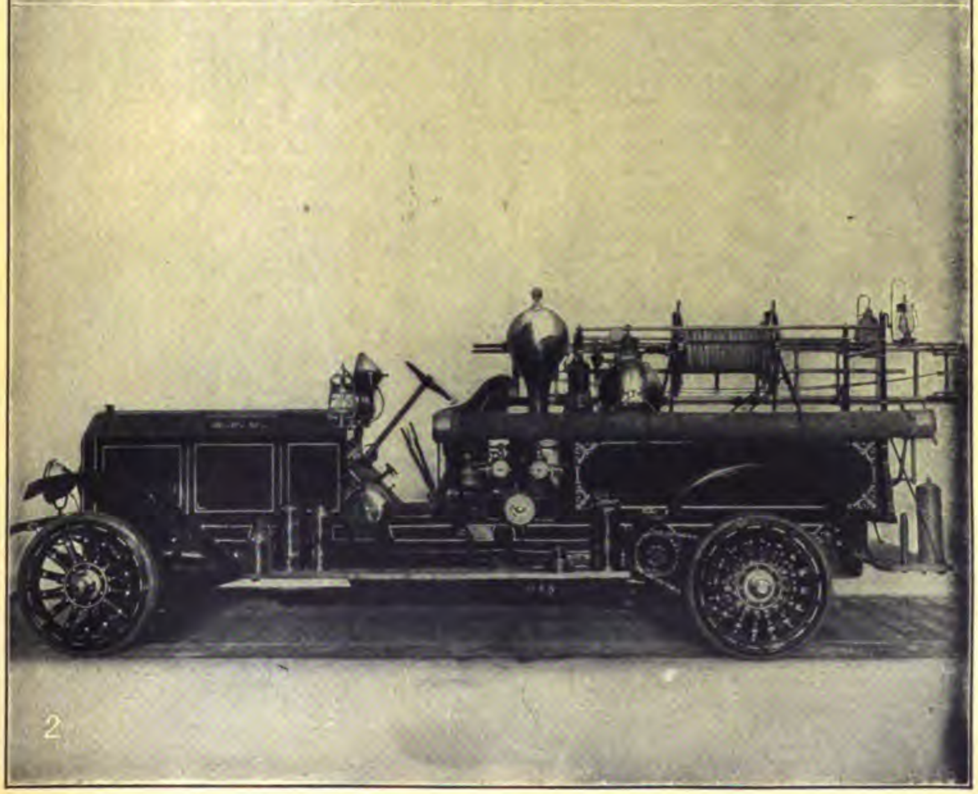
FIRE ENGINE. A machine employed for throwing a jet of water for the purpose of extinguishing fire. Machines for the extinguishing of fires have been used from a very early date. They were employed by the Romans, and are referred to by Pliny; but he gives no account of their construction. Apollodorus, architect to the Emperor Trajan, speaks of leathern bags, with pipes attached, from which water was projected by squeezing the bags. Hero of Alexandria, in his *Treatise on Pneumatics* (written probably about 150 B.C.), proposition 27, describes a machine which he calls "the siphons used in conflagrations." It consists of two cylinders and pistons connected by a reciprocating beam, which raises and lowers the pistons alternately, and thus, with the aid of valves opening only towards the jet, projects the water from it, but not in a continuous stream, as the pressure ceases at each alternation of stroke.

A device with two pumps, worked by levers, is said to have been invented in Egypt in the second century B.C. Apparatus called "instruments for fires" and "water syringes useful for fires" are described in the building accounts of the city of Augsburg, 1518. In 1657 Kaspar Schott described a fire engine used in Nuremberg, invented by one Hans Hautsch, apparently similar to that described by Hero. It had a water cistern, was drawn by two horses, was worked by 28 men, and threw a jet of water an inch in diameter to a height of 80 feet. It was not until late in the seventeenth century that the air chamber and hose were added, the first being mentioned by Perrault in 1684, and the hose and suction pipe being invented by Van der Heide in 1670. In England small brass hand squirts were used up to the close of the sixteenth century, while a work published in England about 1634 describes in detail "divers quirts and petty engins to be drawn upon wheels from place to place for to quench fier among building; the use whereof hath been found very commodious and profitable in cities and great townes." Paris had fire engines of some sort at the beginning of the eighteenth century. In England, in 1734, engines of various construction were manufactured; for previously a law passed in the sixth year of Queen Anne's reign provided that "each parish shall keep a large engine and an hand engine, and a leather pipe, and socket of the same size as the plug or fire cock [of the water mains] that the socket may be put into the pipe to convey the water to the engine." The most successful early English fire engines were those invented by Newsham, but previous to 1686 the engine for extinguishing fire was claimed as an English invention. Two of his machines—the first invention of the kind ever used in this country—were introduced in New York in 1731. It was more than 50 years after this that the leather valves within the cylinders were superseded by metallic valves, placed in valve chests apart from the cylinders and the air chamber. Rotary and semirotary pumps were also introduced. Hand fire pumps drawn by men and horses were used until the advent of the steam fire engine both in Europe and America. In the latter country they figured in the exciting and picturesque days of the volunteer fire departments and are still employed in some small towns, though they are gradually being supplanted with the more general introduction of water supply and small gasoline motors. Floating fire engines worked by hand were used on the Thames before the close of the eighteenth century. In some cases the mechanism that worked the pumps was used to move the paddle wheels. It was not until 1850 that floating fire engines worked by steam came into use in England.

So far as known, the first steam fire engine was developed by Brathwaite in 1829 or 1830. John Ericsson (q.v.) worked on the problem about the same time, and is credited by one writer as having built such an engine with Brathwaite, in London, in 1830, and also with having built one in New York in 1840, very soon after he had come to America. In 1841 an engine was built in New York after plans by Hodge, probably as the result of a competition after the great fire of 1835. This engine was operated occasionally by or for insurance companies, but neither it nor the earlier London engine was satisfactory. In 1850 A. B. Latta, in Cincinnati, produced the first machine which was practically useful. Cincinnati was the first

FIRE ENGINES

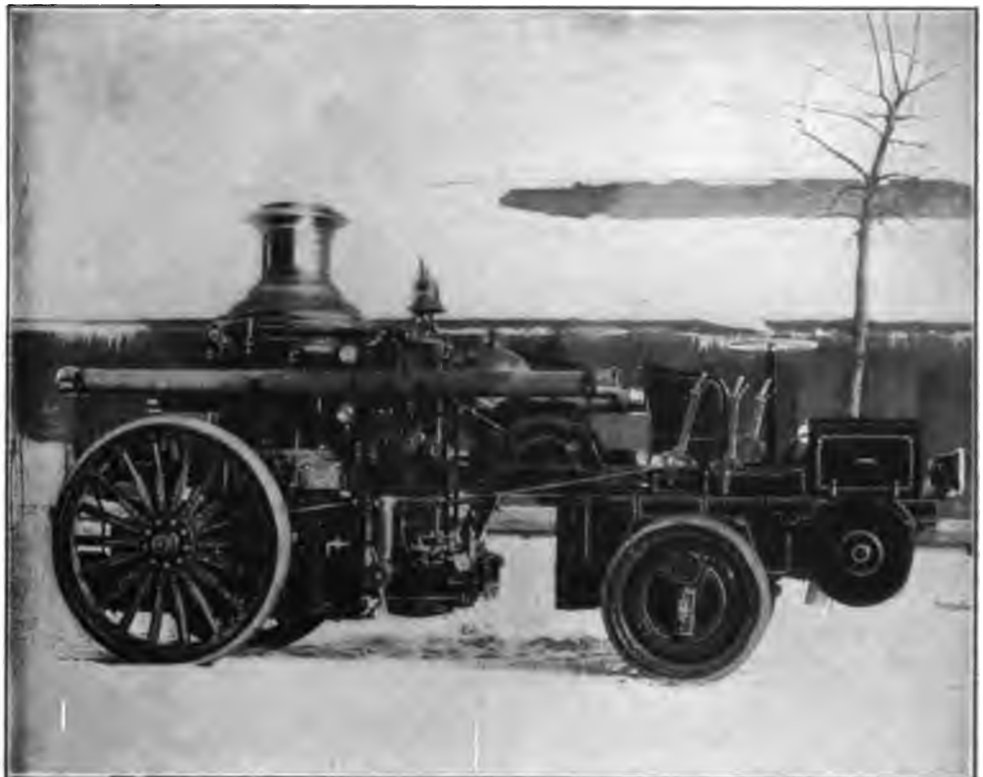


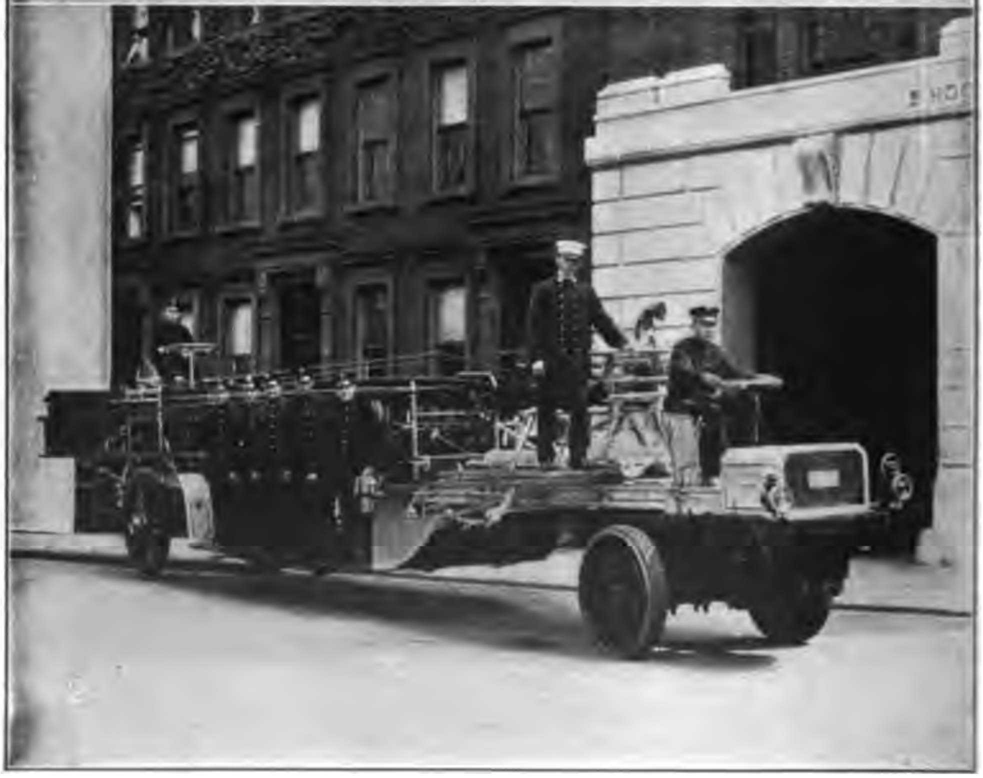


MOTOR FIRE ENGINES

1. CHEMICAL ENGINE WITH DOUBLE 60-GALLON CHEMICAL TANK, SUITABLE FOR VILLAGE USE
2. SIX-CYLINDER TRIPLE PUMPING ENGINE WITH A CAPACITY OF 1400 GALLONS PER MINUTE

FIRE ENGINES





1. AMERICAN STANDARD STEAM FIRE ENGINE WITH FRONT-DRIVE TRACTOR
2. HOOK AND LADDER TRUCK WITH 85-FOOT AERIAL LADDER, PROPELLED BY FRONT-DRIVE TRACTOR

city in the United States to organize a steam fire department, but other large cities and towns rapidly followed the example. In 1872 self-propelled steam fire engines were delivered to both New York and Boston, and in 1873 one was delivered to Detroit. From 1872 to 1898 about 20 similar engines were bought by American cities. The more usual practice, however, was to use steam fire engines drawn by two or three horses, but recently such apparatus is being in large part supplanted by motor pumping engines where gasoline engines supply power both for propulsion and operating the pumps. Such machines have now become quite general and are considered approved practice for fire departments in all parts of the world. Nevertheless the introduction of motor apparatus was for a time quite slow, as it required to be demonstrated that motor-driven machines could be as reliable as the marvelously trained horses of American fire departments. Perhaps the complete triumph for motor fire apparatus was scored in its selection for the fire protection of the Panama-Pacific International Exhibition, when such machines were installed in 1914 in the model fire houses on its grounds.

The main parts of the steam fire engine are the boiler, engine, pumps, and the frame and vehicle on which these are mounted. Boilers are generally of the vertical water-tube type designed for rapid steaming. The engines and pumps are also generally vertical, double-acting, and in duplicate. In some machines both rotary steam and water cylinders, instead of the more common steam pistons and water plungers or reciprocating engines, were employed, while certain light machines had horizontal engines and pumps. To facilitate the readiness of steam fire engines for immediate service, heaters are maintained in the engine house to give a constant supply of steam or hot water to the engines. When the alarm strikes, the boiler pipe connecting with the heater is disconnected, a fire of cannel or other soft coal beneath the boiler is kindled by means of excelsior and dry wood, and steam is soon available as the fire engine proceeds to the fire. The rated capacity of steam fire engines ranges from about 1300 to 400 gallons per minute, and their weights from 11,000 to 5000 pounds. The largest, or extra-first size, steam fire engines now in service have a pumping capacity in excess of 1300 gallons per minute and weigh with water in the boiler about 11,000 pounds. They require three horses to draw them under ordinary conditions.

As soon as horse-drawn steam fire engines had been developed to standard types, attempts were made to utilize the steam in the boiler for propulsion as well as pumping. A number of these engines were adapted to be propelled by power from the main crank shaft, through two chains running over sprocket wheels on the rear wheels of the fire engine. The driver steered the engine by means of a hand wheel and rod connected with the front axle through a bevel and worm gearing. By the removal of a key the road-driving mechanism could be disconnected, whereupon the power became available for the pumps. These self-propelled steam fire engines never enjoyed a wide vogue, and in most fire departments horse-drawn apparatus was considered more serviceable and reliable.

Steam fire engines usually are rated on the basis of their capacity, but it must be remembered that the amount of water discharged depends upon the pressure at the pump, and with an increase of pressure the rate of discharge falls rapidly. The usual ratings of fire engines in American practice are as follows:

STEAM FIRE ENGINE RATING AND CAPACITIES

Rating	Gals. per min.	Per ½ hr.	Per hr.
Double Extra First	1300	39,000	78,000
Extra First	1100	33,000	66,000
First	900	27,000	54,000
Second	700	21,000	42,000
Third	600	18,000	36,000
Fourth	500	15,000	30,000
Fifth	400	12,000	24,000

Possibly the standard size for most American fire departments is the second-size engine, and tests made in Chicago in April, 1912, of three new second-size steam fire engines were considered fairly representative of the capacity of machines of this size. The capacity tests referred to continued for an hour and showed an average discharge for the three engines of 725 gallons per minute at a net pump pressure of 157 pounds. When the pressure at the pump was increased to 275 pounds net, an hour's test showed an average discharge of 409 gallons per minute. The net horse power developed at the pump during the various tests ranged from 61 to 72, an average of 66½.

In this age of self-propelled vehicles the horse-drawn steam fire engine is passing, and in the interests of efficiency and economy is giving place to motor-driven apparatus which, while not entirely perfected, is being developed to an ever-increasing point of efficiency. Self-propelled fire apparatus has passed the experimental stage, and motors and tractors have been developed to a degree where they answer all responsible needs of power, speed, efficiency, and economy. While the well-trained horses not only were picturesque, but were efficient and faithful to a high degree, yet it must be remembered that a large part of the time they were absolutely idle and were performing no useful work in return for their forage and care. Their presence in the engine house required space for their stabling, bedding, and feed and made the building less attractive and sanitary for the firemen living in it. With gasoline motor apparatus there is no consumption of fuel except when it is actually in motion and operation, and the fuel and lubricating oil are inconsequential in comparison with the cost of forage, bedding, shoeing, harness, and veterinary attendance, not to mention the more rapid depreciation of live stock.

In the transitional period from the supplanting of the steam fire engine to the motor machine, the first general step has been the elimination of the horses and the substitution of some form of tractor at the front wheels. In place of the horse-draft gear, three and four wheeled tractors have been placed under the fifth wheel of an ordinary steam fire engine, as well as other apparatus, and have answered admirably, while special forms have been developed, such as the front-drive tractor used in the New York, Pittsburgh, Manila, and other fire departments, where a special form of motor fitted to the front wheels has been added to the lengthened frame of a steam fire engine. Another form of tractor for steam fire engines consisted of a couple-gear arrangement where storage batteries furnish current to motors placed at the front wheels. Steam fire engines have been motorized in many other ways and have been used to great advantage.

It must be remembered that the firemen of most large American fire departments are thoroughly conversant with the operation of the steam fire engine, which has proved thoroughly reliable and susceptible of regulation, and in addition is able to thaw out with its steam frozen hydrants, an important consideration for cities with severe winters. Records have been made of steam fire engines operating continuously over 72 hours, while a capacity up to 1600 gallons per minute has been obtained. As showing the endurance of a steam fire engine, it may be stated that a record of three months' constant operation in service was made from Nov. 18, 1913, to Feb. 18, 1914, during which time the machine was shut down twice to replace burned-out grates, three times to replace broken valve springs and overhaul valves, and once to replace a broken piston follower.

In regard to motor pumping engines, as desirable as they are, progress, while rapid, had not reached a point where in 1914 such machines had secured universal acceptance in the large fire departments. The New York City fire department, e.g., has never been willing to purchase motor fire engines unless the standards set for second-size steam fire engine could be met, although it has installed a number of motor-driven steamers of this size. The motor fire engines consist of pumps driven from the main engine shaft, which is connected with the propelling mechanism by a system of gears to reduce its rapid revolution to a useful speed for reciprocating pumps or to a less extent for rotary pumps. In the smaller sizes of motor pumping fire engines, especially those available for village and suburban use, machines of remarkable usefulness and efficiency have been secured. These are fitted either with reciprocating or rotary pumps and carry a reasonable amount of hose and other equipment, including sometimes chemical tanks which are ready for use at a moment's notice. Such a machine, having a speed up to 40 miles an hour, or far in excess of any ordinary requirements, can be maintained at a central point in a village with a minimum of regular employees in attendance and be available for service over a wide territory. Even for a city such an engine is able to deal with incipient fire, if not through its chemical tanks, by means of a stream of water promptly applied. These machines were brought out first about 1907, and since that time have been developed and put in extensive use.

At first, insurance officials favored piston reciprocating pumps, and consequently the rapid rotary motion of the shaft had to be reduced by appropriate gearing or chain drives. Although plenty of power was available, this process was not marked by efficiency, and at the higher pressures the pumping capacity of many motor fire engines, due to excessive slip and other causes, was limited. Mechanical engineers, however, mindful of the success of centrifugal and rotary pumps in other fields, endeavored to perfect this form of mechanism in the motor pumping engine, and gradually increased efficiency was secured, so that a demonstration test to show endurance, reliability, and capacity, which took place at New York in connection with the annual convention of the International Association of Fire Engineers in 1913, brought out 11 motor pumping engines, of which three were able to pump for the entire period of 12 hours assigned for the test. Two operated for 10 hours steadily, two for 9 hours without cessation, and one for 8 hours. At these tests a Seagrave motor pump, rated at 1000 gallons per minute capacity, discharged at 125 pounds' pump pressure at a rate of 1049 gallons per minute; at 204 pounds' pressure, 595 gallons per minute; and at 256 pounds' pressure, 323 gallons per minute. An American La France motor pump, rated at 1400 gallons' capacity, at 132 pounds' pump pressure, discharged at the rate of 1402 gallons per minute; at 209 pounds' pressure, 734 gallons; and at 268 pounds' pressure, 626 gallons. An even better record for endurance than this was made a few months later, when a motor engine drafting water from a distance of 24 feet worked for 24 hours without stopping.

Fire Boats. To protect the water front and harbors of cities where fire is apt to have the most disastrous effects on piers, warehouses, and especially lumber yards and factories, floating fire engines in the form of fire boats are generally employed, and their design and construction have resulted in excellent types of marine engineering. In such a fire boat, pumping capacity must be combined with reasonable speed and ease of manœuvring, as the boat must nose its way into slips and take up a position adjoining a bulkhead or wharf from which it can deliver through turret nozzles and standpipes vast quantities of harbor water. These fire boats are maintained constantly under steam and respond to alarms just as an ordinary land company. In many cases their powerful pumps make them available for service at fires quite a little distance inland, as heavy hose may be laid from the waterside to the scene of the fire, while it is also usual with high-pressure systems to provide for the connection of the pumps of the fire boat with the main system to supplement the pumps of the central station when necessary. Various forms of pumping machinery have been installed on such fire boats, the earliest of which were equipped with double-cylinder, vertical, inverted, reciprocating pumps, each of which might have a capacity as large as 3000 gallons per minute. With higher steam pressures the centrifugal pump either directly driven by means of steam turbines or by some form of electric drive with generators and motors has been found well adapted for this service. In the New York fire department there were in service, in 1914, 11 fire boats, three of which were equipped with centrifugal pumps, the largest of which was 326 tons, 131 feet in length and 28 feet beam, with a pump capacity of 9000 gallons per minute.

At the great iron-ore docks at Duluth, Minn., belonging to the Duluth, Missabe, and Northern Railway, a powerful fire boat, the *William A. McGonagle*, is maintained with pumps able to deliver 12,000 gallons per minute at a pressure of 150 pounds under ordinary conditions. This boat is 120 feet in length, 28 feet molded beam, and is driven by a double, vertical, high-pressure engine with cylinders each 20 inches in diameter by 24 inches' stroke. The pumping equipment consists of two sets of two-stage centrifugal pumps, each driven by an 800-horse-power horizontal-shaft Curtis steam turbine, the two sets so arranged that they can be operated in series and a pressure of 300 pounds per square inch obtained. For the San Francisco fire department two fire boats, each 129 feet in length and 26 feet beam, are maintained with steam turbines connected each to two multistage centrifugal pumps, each set capable of delivering 4500 gallons per minute at 150 pounds' pressure, or half this amount at 300 pounds' pressure. The fire boats of Chicago are somewhat different in that both the pumping machinery and propelling motors are electrically driven, two 660-horsepower Curtis turbines being directly connected to 200-kilowatt direct-current generators and two-stage centrifugal pumps and propelling motors. These fire boats can deliver at an emergency between 10,000 and 11,000 gallons of water per minute at 150 pounds' pressure. Philadelphia, Boston, Seattle, Detroit, and other cities all maintain large and efficient fire boats, and the details of construction have been worked out with considerable skill. Often local conditions have governed and a boat of light draft is required. The equipment consists usually of a turret mast and a number of turret pipes, and there is stowage capacity for a large amount of heavy 3 or 3½ inch hose.

Chemical fire engines and extinguishers range all the way from apparatus mounted on wheels and drawn by men or horses, and an integral part of a hose tender or special motor car, to small tanks carried on a fireman's back, or small hand force pumps. The aim of all such devices is to smother the fire by means of some gas, such as carbonic-acid gas. The larger and more effective apparatus include a generating tank or tanks, possibly as large as 45 gallons' capacity, in which water and soda are placed, with an agitator to aid in dissolving the soda, an acid-feeding chamber, and some 200 or 250 feet of ¾ or 1 inch hose carried in a basket or on a reel. If the generating apparatus is in duplicate, with proper hose connections, continuous streams may be thrown; otherwise the stream will cease while recharging is in progress. The water serves as a medium to carry the gas, and the gas is the motive force for the water. Small quantities of water are required as compared with fire engines, thus permitting a relatively light apparatus and small and easily managed hose. For incipient fires, or some of those where water is inefficient, the chemical apparatus is very useful, and for that reason it is often mounted on a high-speed motor car, which may, in addition, carry the hose supply for a following fire engine as well as useful tools and appliances for the firemen, this being a most advantageous arrangement, and may be employed to advantage in some cases where the cost of steam or motor pumping fire engines is prohibitive, or where the local water pressure is adequate in connection with the transportation of the firemen. See Fire Extinguisher; Fire Protection, Municipal.

FIRE ESCAPE. A stationary or portable device to enable people to escape from burning buildings when ordinary means of egress to the ground are destroyed or cut off by flames, and also, a point less often considered, to enable the firemen to reach the seat of the fire. In England the term is applied to a portable extension ladder that may be wheeled up to a building on fire to furnish a means of egress to the occupants. The fire escape most used in America, and usually required by city building laws, consists of balconies attached one above another to the outside of the building, connected by iron ladders with each other, and opening on to each floor at a door or window. Such fire escapes are made entirely of iron, and one or more of them may be used according to the size of the building, though in most cases they leave much to be desired. Modern conditions of building and fire hazard have led to the adoption of inclosed fire towers or fire and smoke proof stairways independent of the main building, from which access may be had from each floor by long outside balconies or by entrances cut off by fire-resisting doors. These towers have stairs with broad treads and handrails and are designed to effect the rapid emptying of the building. Sometimes these towers are of steel only partially inclosed, but communicating with balconies at each floor. Portable fire escapes may be operated from the interior of the building or from the outside, according to their character. Interior fire escapes of this class vary in character from a simple knotted rope placed in each room, and down which the person seeking escape slides, to more elaborate devices, like canvas tubes, spiral chutes, cables with slings, etc. Portable fire escapes operated from the outside consist of ladders, telescopic tubes carrying slings, cables which may be thrown up into open windows, etc. One of the most practical and effective of all of these devices is a simple ladder of sufficient length to reach from one story to the next, and provided with large hooks at one end which may be inserted over the window sill. The first ladder is placed from the ground, the second from the top of the first, and so on until a line of ladders extends from the ground to the top floor, down which the occupants of the building may descend alone or be carried by the firemen. The efficiency of all these devices in saving life depends largely upon the coolness and self-possession of the endangered persons and those who are trying to aid them, and upon the device being maintained in working order, a matter that is often neglected. For these reasons various authorities on fire protection are coming more and more to advocate that reliance on safety from fire should be placed on fireproof construction, aided by the use of stationary fire escapes of the first kind described and the frequent instruction and drill of the occupants of the building in leaving in orderly ranks without panic or confusion. See Fireproof Construction.

FIRE EXTINGUISHER, or Fire Annihilator. An apparatus by means of which fire may be extinguished, usually by spraying on it certain liquids or water charged with a gas that is incapable of supporting combustion, especially carbon dioxide (q.v.). An extinguisher of this character was originally brought into successful use in London in 1816, and a patent was applied for in the United States for a similar apparatus by William A. Graham in 1837. These extinguishers are strong metal cylinders of convenient size, partly filled with a solution of soluble carbonate, usually bicarbonate of soda. In the upper part of the cylinder is placed a glass receptacle, containing sulphuric acid, closed with a loosely fitting stopper. When the apparatus is to be used, the cylinder is inverted and the acid mingles with the carbonate solution. By decomposition carbon dioxide is generated in sufficient quantity to saturate the liquid and produce considerable internal pressure. The result of this pressure is the forcing of the carbonated liquid through a short flexible nozzle which may be directed so as to envelop the burning material. In the early types the apparatus was carried on the back, and the discharge of acid and flow of the liquid were controlled by valves. At present these have been largely discarded. Large cylinders containing chemical salts have been mounted on wheels, for service on the floors of large establishments, or, still larger, they are known as "chemical fire engines," and are used in many of the larger cities. (See Fire Engine.) For the extinguishing of fire on shipboard a series of pipes have been arranged on the upper deck that communicates with the various compartments of the vessel, as the coal bunkers, the hold, the main deck, etc. Chemical agents are placed in the receptacle, to which steam may be admitted, and in case of fire the steam mingles with the carbon dioxide, and the two are conveyed to the place of danger, where they replace air, smother and finally extinguish the fire. Similar arrangements, known as sprinkler systems, in which water is released automatically when the temperature rises to the danger point, are in use in factories. In extinguishing fires caused by an electric current care must be taken not to use any solution which will conduct electricity. Extinguishers charged with chloroform or carbon tetrachloride mixtures may be used.

Hand Grenades, or bombs filled with fire-extinguishing solutions of chlorine or ammonium chloride, borax, mixtures of calcium chloride, magnesium sulphate, sodium carbonate, sodium chloride, and sodium silicate, are in common use; but they are of value only in the first stages of a fire. See Fire Engine; Fire Protection.

FIREFLY. The name of many luminous beetles of the families Lampyridæ and Elateridæ, the former of which is known as the firefly or lightning-bug family. The Lampyridæ are pentamerous beetles of small size and soft texture, with the head frequently hidden under the prothorax, but sometimes prominent and with serrate antennæ; the elytra are soft and yielding, are often abbreviated, and in some genera totally wanting in the females, which are wingless, and larvæ-like in other respects. These and the true larvæ are called glowworms and are often more luminous than the adult male lightning bugs. "The larvæ are flattened, often dark-colored and velvety, and have an ocellus on each side of the retractile head; they are generally carnivorous, living under stones and bark, and upon the ground, where they devour snails and larvæ of insects. Sometimes the velvety larvæ of certain species of *Telephorus* wander about upon the snow, giving rise to stories of showers of worms."

The family Lampyridæ is confined to warm or tropical lands and is very abundant in southern Europe and in most parts of the United States. Fireflies are gregarious, and their luminosity is most evident on warm, dark nights. The light-giving part is situated ordinarily on the sides of the abdomen, and the light is greenish white, like phosphorescence; but in South America there is a remarkable form, probably a female of the group Phengodini, which flashes a red light at each end of the body and a green light along the sides, suggesting signals, so that it is known in Paraguay as the railway beetle. The emission of light by the lampyrid lightning bugs and glowworms is intermittent, but at definite intervals, in one case averaging about 36 flashes a minute, but this varies a little from night to night, perhaps with the temperature. The function of the light of Lampyridæ is unknown to us, but since many of the fireflies have unusually well-developed eyes, and since most of them are active at night, the flash would seem in some way to be important for the firefly. In some species of Lampyridæ not only both sexes, but the eggs, larvæ, and pupæ are luminous. A common species of lampyrid firefly in the eastern United States is *Photuris pennsylvanica*, about ½ inch long, yellowish and obscurely striped; its luminous larva has a brushlike anal leg. A Western species is *Photuris pyralis*, which has brownish-black elytra margined with dull yellow, and whose larvæ live in the ground and feed upon worms. The most familiar European species is the common glowworm of England (*Lampyris noctiluca*), of which the blackish female, ½ inch in length, is entirely wingless and without elytra and crawls about in the grass emitting a soft, steady light, occasionally interrupted. The males and the larvæ are also faintly luminous, the latter being noted for their voracity and their devouring of snails. In another genus, plentiful in southern Europe, both males and females are winged and luminous, the male giving a stronger light than the female.

Luminous Elaters. The second family that contains luminous beetles is the Elateridæ. These give forth at will a steady light and are all tropical American beetles of the genus *Pyrophorus*. There are about 100 species of this genus, but not all are luminous. These wonderful insects were seen and described by some of the early explorers of America, but even to-day only one form, the cucuyo (*Pyrophorus noctilucus*), has been studied. It has two yellowish "eyelike lamps" on each side of the prothorax through which light shines. The ventral surface of the abdomen is also strongly luminous, but this light is only evident when the insect is in flight. These beetles are frequently used as ornaments for the hair, especially in Vera Cruz. They are blackish brown and nearly 2 inches in length, so that one may believe the report that the Indians sometimes use them as lanterns.

The firefly produces light practically without loss of heat or chemical rays, but concerning the method of the production of this most economical light we know little. An account of what has been learned of the nature and purpose of this luminosity will be found in the article Luminosity of Animals.

FIRE INSURANCE. It is impossible to determine just when a scientific system of insurance against loss by fire was first introduced. The principle of mutual aid in times of distress was embodied in many societies both in ancient and in mediæval times, and one of the generally recognized occasions for such aid arose when the property of a member was destroyed by fire. In the ordinances of the guilds of the later Middle Ages, e.g., we find regulations for the payment of a certain amount of indemnity to any member who suffered loss of property by fire. This amount was sometimes paid out of the funds of the guild, and was sometimes raised by a specific assessment on the other members. In neither case were the essential principles of insurance observed. There was no separation of the insurance fund from the other funds of the guild, and no payments to the guild by the members based on the risk which the guild assumed. The indemnity bore no definite relation to the amount of loss, or to the amount which the members had paid to the guild, but was either fixed beforehand as a uniform sum or a uniform contribution from each member, or else was arbitrarily fixed by the guild itself after the loss had occurred.

England. The earliest recorded proposal for the establishment of a scientific fire-insurance company in England was made in 1635. The first office was opened by N. Barbon, in London, in 1667, the year after the great fire. It is highly probable that the business had already been introduced on the Continent. Barbon's method was that of individual underwriting. The first joint-stock association for insuring against loss by fire was established in 1681. The oldest surviving English company, the Hand in Hand, was founded in 1696. No less than five other existing English companies date back to 1720 or earlier.

United States. The first fire-insurance company in the United States was opened at Philadelphia in 1752 and incorporated in 1768. It was called the Philadelphia Contributionship for the Insurance of Houses from Loss by Fire. Benjamin Franklin was one of its first directors. This company still survives. It is a mutual company and writes only perpetual risks. Its business is confined to the State of Pennsylvania. The development of the fire-insurance business was slow at first, being greatly retarded by the financial and industrial disturbances due to the Revolution. Before the end of the eighteenth century, however, at least 30 charters had been granted to companies for carrying on the business. Among the oldest existing companies may be mentioned the Insurance Company of North America and the Insurance Company of the State of Pennsylvania, both located in Philadelphia and both incorporated in 1794; the Mutual Assurance Company of the City of Norwich (Conn.), which began business in 1795; and the Providence Washington Insurance Company, of Providence, R. I., incorporated in 1799. The oldest existing New York company was organized in 1806, and the oldest Massachusetts company in 1818. Thousands of charters have been granted to fire-insurance companies since the beginning of the nineteenth century, but many of them have never been used. In a general way the number of new companies established from year to year has varied with the general prosperity of the country, and every period of depression has seen the failure or withdrawal of a number of companies. The most trying time in the history of fire insurance in the United States during the last 50 years came in the early seventies. In October, 1871, as a result of the Chicago fire, insurance companies became liable for indemnities amounting to more than $96,500,000. In November of the following year occurred the great Boston fire, which brought a loss of more than $52,600,000 upon the companies. These two great losses, coming in quick succession, subjected all fire-insurance companies to great strain. More than 100 of them were forced to suspend operations, while many others found their surplus wiped out and their capital seriously imperiled. The Baltimore fire of 1904 involved losses to the companies estimated at $60,000,000, and the San Francisco fire of 1906 involved about $175,000,000 in losses to the companies. The fire-insurance companies are so much stronger financially than they were in earlier decades, that comparatively few failures were occasioned by these two great catastrophies. The history of the last 100 years shows a nearly constant growth in the magnitude of the fire-insurance business, and a steady improvement in the financial standing of the companies. During the latter part of the nineteenth century the establishment of governmental supervision of insurance companies in many of the States, involving periodical reports from each company, and thus a great degree of publicity as to its financial condition, has done much to prevent reckless management on the part of the companies and to protect the interests of the insured.

It is impossible to obtain complete statistics of the number of fire-insurance companies in the United States or of the amount of business they transact. In a number of the States certain companies, especially the small mutuals, are exempted from the duty of reporting to the commissioner, and statistics about such companies are nowhere attainable. There are probably in the United States at the present time nearly or quite 2000 companies granting insurance against fire. Of this number, however, only about 150 are of any considerable size or operate over a large territory. The total amount of fire insurance carried by all the companies exceeds $50,000,000,000. The average rate of premium in 1912 was practically $8.90 for each $100 of insurance. The aggregate premiums collected in 1912 by the companies reporting to the New York Insurance Department were $454,943,419.

Some indication of the increase in the use of fire insurance by property owners may be gained from a comparison of the total fire loss for different periods with the losses sustained by the insurance companies during the same periods. The figures given in the *Spectator Year Book* for 1902 indicate that, in the decade 1881–90, 57.4 per cent of the total fire loss was covered by insurance, while, in the decade 1891–1900, 60.9 per cent of the total loss was thus covered. The following table, compiled from the reports made to the Insurance Department of the State of New York by companies operating in that State, which, it must be remembered, does not include companies not operating in the State, may serve to illustrate the growth of the business during the last 40 years of the nineteenth century and the early years of the twentieth century:

YEAR	Risks in force December 31	Premiums	Losses
1860	$1,466,954,382.57	$14,436,869.76	$8,570,956.74
1870	4,149,473,784.00	37,916,965.23	22,476,300.70
1880	7,305,729,981.00	61,126,535.51	43,243,439.94
1890	15,272,785,000.00	104,706,417.51	57,026,230.29
1900	22,352,562,553.00	141,232,031.75	89,566,490.00
1912	51,202,402,351.00	454,943,419.00	157,923,447.07

Organization. *Stock Companies.*—Nearly all the fire-insurance companies in the United States are organized either as mutual companies or as joint-stock companies. There are a few organized as unincorporated associations of individuals, transacting business on the principle of the English Lloyds. The mutual companies are more than five times as numerous as the joint-stock companies, but the risks carried by the relatively small number of stock companies are many times as great in amount as those carried in the mutual companies. The relation of the insured to the stock company is simple and definite. By paying the stipulated premium he becomes entitled to indemnity in case of loss by fire within a given time. He incurs no liability, but substitutes a certain and definite periodical payment for the possibility of a loss of uncertain amount. It is probably the element of certainty and definiteness that gives the stock companies a large part of their advantage over the mutual companies.

Mutual Companies.—The relation of a person insured in a mutual company to the company is by no means so simple as in the previous case. In the simplest form of mutual insurance the funds necessary to pay losses are raised by assessment after the losses have occurred. Under such a system neither profit nor loss can arise, as the assessments are made to cover only loss and expenses. Experience has shown, however, that it is extremely difficult to raise the required amount in this way, whenever losses are unusually heavy. The general custom among the older mutual companies at the present time, therefore, is to collect a part of the necessary funds by premiums paid in advance and to hold the insured responsible for such additional amounts as may be required to pay losses. The liability of the insured is, however, frequently limited to a certain amount or to a certain proportion of the cash premium. This liability varies in different companies from a sum equal to the premium to a sum equal to five times the premium and occasionally to an even greater sum. Many of the older companies have accumulated large surpluses, out of which they are able to pay any exceptional losses they may suffer, and in normal years to return to the insured in the form of dividends a very considerable part—not infrequently as high as 90 per cent—of the sum collected as premiums. In the Western States in recent years the mutual principle in fire insurance has manifested itself in the establishment of numerous "town" and "county" mutual companies. The activity of these companies is usually limited to a single town or county. They are very largely engaged in insuring the property of farmers. They act on a plan somewhat different from that of the older Eastern companies. Instead of keeping up rates and using the annual gain to accumulate a surplus or to increase dividends they establish comparatively low rates. On long-time insurance usually a small part of the premium is paid in cash and the rest is paid by premium notes. The liability of the insured is limited to the amount of the notes given by him. No payments have to be made on these notes unless the losses of the company compel it to make an assessment. At the expiration of the term of insurance the notes are canceled. In many of the States the companies are authorized to count these premium notes as the whole or a part of the legal reserve, and they are to that extent freed from the necessity of accumulating a cash reserve sufficient to reinsure outstanding risks.

Lloyds.—In the early nineties there were organized in the United States a large number of fire companies on the plan of the English Lloyds. Most of these companies were located in New York, where a special provision of the insurance law gave them a temporary advantage. A "Lloyds" is neither a joint-stock company nor, in most cases, a mutual company; it is rather a partnership with limited liability. It is an unincorporated association of individuals, each of whom deposits a certain amount and assumes liability for a limited additional amount. In the English Lloyds, where marine insurance is written, each member of the association does his own underwriting, specifying how much, if any, liability he will assume on each risk offered. In the United States companies, on the other hand, the actual management of the business is put in the hands of an attorney, who writes the insurance. Each member of the association incurs liability on every risk written, in proportion to his share in the deposit fund. In case of loss the deposit fund, and, if necessary, the additional liability of the subscribers, may be drawn upon to meet it. There is no reason in the nature of things why an insurance company so organized should not be as strong as a stock company. As a matter of fact, the stability of the English Lloyds is above question. The essential thing is financial responsibility on the part of the members of the association. In a great majority of the American companies this has been lacking. Not only was the additional liability assumed by the members usually of no value, but the deposits themselves were frequently in the form of notes, on which it was found impossible to realize in case of need. In New York the Lloyds survived in large numbers only so long as they were able to escape the supervision of the Insurance Department. As soon as they were brought under the provisions of the General Insurance Law, most of them disappeared. Of the 125 companies in New York in 1895, not more than 17 were surviving in 1909. During the last few years, however, Lloyds have been appearing in considerable numbers in Chicago under the lax provisions of the Illinois insurance law. A person inclined to seek insurance in the Lloyds, on account of the low premium rates offered, needs to remember that unless the company is organized in a State in which the Lloyds are under careful supervision by the Insurance Department, he has no assurance of the stability of the association. The actual value of the assets of the company may be far below the nominal value. Moreover, as the association is not a corporation, a person having occasion to bring suit against it must resort to the courts of the State in which the association is located.

Foreign Companies. Foreign fire-insurance companies, chiefly British and German, write a considerable amount of business in the United States. Many of the States have laws requiring a deposit by foreign companies of other States before licensing them to do business in their borders. Several of the foreign companies have found it advantageous to do the whole or a part of their American business through subsidiary American companies. Sometimes such a company is directly established by the foreign company; sometimes the foreign company buys up an already established American company. More than 50 foreign companies are operating in the United States and write over a quarter of the entire fire business of the country. Partly on account of the tendency in some States to discriminate against the foreign companies, many of these companies show a disposition to contract rather than to expand their American business. Only two States—Connecticut and Kansas—actually discriminate between foreign companies and companies of other States. In

Kansas the tax is 4 per cent on the gross premiums of the former, and 2 per cent on similar premiums of the latter; Connecticut imposes a tax of 2 per cent on gross premiums of foreign companies and has for other-State American companies the reciprocal provision. But while the actual legislative discrimination against the foreign companies is not very widespread or very severe, the possibility of such legislation and the somewhat common advocacy of it tend to drive the companies away. About 20 such companies withdrew from the United States, either wholly or in part, in the five years 1901–05 and four more in the five years 1905–10.

Self-Insurance. When many pieces of property so situated as to constitute separate risks are owned by a single individual or corporation, the proprietor sometimes finds it cheaper to "carry his own insurance" than to have recourse to an insurance company. When a corporation adopts this plan of self-insurance, it usually sets aside an insurance fund, out of which any property destroyed by fire is to be replaced. The losses which are suffered fall wholly on the corporation; the insurance fund merely enables it to meet them without embarrassment. The prevalence of this custom of self-insurance against fire among large corporations constitutes a serious indictment of the management of fire-insurance companies. A part of the gain from a system of insurance comes from combining many separate risks in a single company, since the more risks the company carries (provided, of course, they are properly classified) the less fluctuation will there be in the amount of loss, and the smaller the reserve which will have to be maintained to prepare for unexpected losses. Consequently, however many risks of its own a corporation may be carrying, it should be to its advantage to combine them with as many other similar risks as possible. That so many large corporations find it cheaper to carry their own insurance can be explained in only one way —that the insurance companies charge more for the protection they give than is justified by the risk they assume. A slight extension of the principle of self-insurance is seen in the strictly mutual insurance companies often formed, composed of a small number of persons all engaged in some one line of business. Perhaps the best-known example of this kind of company is to be found in the so-called "mill" or "factory" mutuals of New England. Such a company consists of a limited number of persons or corporations engaged in some particular line of manufacture—as, e.g., the cotton manufacture —each of whom insures the whole or a part of the value of his mill in the company. Nearly all of these companies are very stringent in their requirements as to the protective measures to be adopted by their members. The adoption of these measures greatly reduces the danger of loss by fire and so lessens the degree of risk. These companies, however, like individuals, should be able to insure more cheaply in large insurance companies, if those companies charged no more for the business than the risk justified.

The Agency System. While fire-insurance companies were small and their activities were confined to limited areas, it was possible for all the business of any one of them to be done through a single office. With the growth of the business and the extension of the field of operation of the larger companies, the single-office system became cumbersome and unwieldy. To meet the difficulty, the "agency system" was introduced, for a time tentatively and to a limited extent. It was first tried successfully on a large scale in the early fifties, by the Home Fire Insurance Company. It has since become practically universal among the large companies. Under the agency system the territory constituting the field of operation of an insurance company is divided into a number of departments, varying for the whole United States from 2 or 3 to 10 or 12 in number. Over each department is a general agent or manager, who is practically in charge of the business of his company throughout his department, subject to the general instructions received from the home office. The manager appoints and supervises two classes of subordinate agents—local agents, one or more in each locality where the company does business, and special agents, usually one for each State. The local agent is the one who solicits business and actually writes the insurance, making periodical reports to the general agent in charge of the department which includes the locality in which he works. That the local agent may have the greatest incentive to diligence in securing business, his remuneration takes the form of a commission on the premiums received. This method of payment has the disadvantage of putting the agent under a strong temptation to accept undesirable risks, or to secure business by improper methods, for the sake of obtaining his commissions. It is one of the field functions of the special agent, or "field man," to keep watch over the local agents and prevent them from sacrificing the welfare of the company to their own pecuniary interests. The special agent is paid a salary instead of commissions, and his chance of promotion lies in making a good showing for his district. His interests coincide with the interests of the company he represents.

That the agency system has been largely responsible for the great extension of fire insurance in the United States cannot be doubted. The method is, however, a very costly one. The direct cost in the form of commissions is enormous and is increasing from year to year. Thus, for the fire insurance written in the decade 1861–70 commissions amounted to $11.21 for every $100 of premiums; in 1871–80 they were $14.61 per $100 of premiums; in 1881–90, $17.89; in 1891–1900 they varied from $17.90 in 1894 to $20 in 1900; and in the decade 1901–10 they ranged from $20.28 in 1902 to $21.89 in 1908. Moreover, this direct expense represents but a small part of the cost of the agency system. While the companies themselves are by no means entirely free from blame for the recklessness with which at times rates are cut and risks accepted, it is the uncontrollable zeal of the local agents for business and resulting commissions which usually inaugurates such a movement. The result of the movement is the acceptance of undesirable risks, or of desirable risks at too low a rate, a consequent diminution in the ratio of premiums to insurance written, and, when the effect of the poorer risks has made itself felt, an increase in the proportion of fire losses to insurance written, and finally the failure of weak companies and the depletion of the surplus of strong companies. The situation at length becomes intolerable, compelling a movement to restore rates to a paying basis, and general and special agents for a time exercise great care in their supervision of local agents. The effect of the bad risks accepted during the period of rate cutting disappears after a year or two, and a period of prosperity follows, which lasts until the cycle starts anew. While local agents have done much good in extending insurance among people who would never have resorted to it unsolicited, and while it is difficult to conceive of any other system on which the business of a large company can be well carried on, still it must be acknowledged that the multiplicity of agents, the magnitude of their tax upon the insured, and the wide divergence between the interests of the agent on the one hand and those of the insurer and insured on the other, are very serious evils necessarily involved in the agency system.

Associations of Underwriters. The tendency to association on which the business of insurance is based is manifested in the formation of all sorts of unions and associations among those engaged in it. In the department of fire insurance these associations are especially numerous and have attracted much attention through the obvious attempts of some of them to replace competition by mutual agreement as a regulator of rates. There are in the United States more than 30 general associations of fire underwriters, some of them extending over many States, besides a considerable number of local associations, each confined to a particular city. Many of the forms of activity of these associations are universally recognized as legitimate. As examples of such activities, may be mentioned the offering of rewards for the apprehension of incendiaries, the inspection of fire departments and water works, and the organization and support of fire patrols.

Anticompact Laws. It is the attempt of the underwriters' associations to regulate rates and thus restrict competition which has attracted the most attention. The popular feeling has undoubtedly been that the rate agreements entered into by nominally competing companies through underwriters' associations have resulted in keeping premium rates illegitimately high. The discussion of the question how far competition affords a desirable regulator of rates in the insurance business belongs in the treatment of the general subject of insurance. It is of immediate interest at this point to notice the legislation against rate agreements which several States have enacted in recent years. Such laws are known as anticompact laws. The earliest one was passed in Ohio in 1885. This law prohibits not only agreements as to the rates to be charged for insuring against loss by fire, but even agreements as to the commissions to be paid to agents for securing business. Similar laws, so far as the control of rates is concerned, are now in force in 10 States besides Ohio—viz., Alabama, Georgia, Iowa, Louisiana, Michigan, Nebraska (declared unconstitutional by the United States District Court, and by the Supreme Court on appeal), New Hampshire, South Carolina, Washington, and Wisconsin. In four other States—viz., Arkansas, Kansas, Missouri, and Texas—such combinations are specifically included among those prohibited by general antitrust laws. The anticompact movement apparently reached its height in the years 1897–99, no fewer than eight of the 15 laws in force having been passed during that time. In 1900 only one such law was passed, and none in 1901. In 1902 Virginia repealed the law which she had enacted in 1899. It is coming to be recognized that the attempt to prevent rate compacts by prohibitory legislation cannot succeed, owing to the ease with which secret agreements can be entered into, and it is coming to be suspected that the condition of reckless underwriting which prevails when compacts are actually abolished may be a worse evil than the relatively high rates maintained by means of the agreements.

Relation of Insurance to Amount of Loss by Fire. Increase in Number of Fires Owing to Insurance. The relation of insurance to the amount of fire loss deserves careful consideration. Over against the great gain which the system of fire insurance confers upon society must be set a direct loss due to the increase in the amount of property destroyed by fire as a result of the insurance itself. A part of this increased loss is due to the greater carelessness of the owners because of the insurance; a larger part is due to the deliberate destruction of insured property by the owners for the sake of securing the insurance. What proportion of fires is due to incendiarism it is impossible to determine with accuracy. Various estimates, ranging from 20 to 40 per cent, have been made by different investigators. If fires of unknown origin are largely counted as incendiary, as there is a natural tendency to count them, the proportion is made unduly high. In Massachusetts, for a period of seven years just preceding the first appointment of a State fire marshal, which occurred in 1894, incendiary fires and those of unknown origin combined constituted 33½ per cent of the total number of fires. The proportion in most States is undoubtedly higher. It must be borne in mind, however, that by no means all incendiary fires are set for the purpose of obtaining insurance. In Massachusetts, e.g., in the four years for which statistics are available—viz., 1896, 1897, 1900, and 1901—out of a total of 1264 incendiary fires, only 408, or 32 per cent, were set for the insurance. During the same years incendiary fires constituted 7.1 per cent of the total number of fires in the State. On the basis of figures for Massachusetts, Ohio, and West Virginia, Mr. Frank Lock estimated that, of the loss of $29,291,430 through fires of incendiary origin in 1912, 38.5 per cent, or $11,277,200, represented fires set for the purpose of securing insurance money. Insurance fires, according to this estimate, amount to 5 per cent of all fires. The value of the property deliberately destroyed in order to obtain insurance constitutes one element in the cost of insurance. The insurance companies themselves are indirectly responsible for a part of this loss. It is a matter of common knowledge that agents and brokers show too great laxity in granting insurance on property up to, and sometimes far beyond, its full value. Every instance of overinsurance is a standing invitation to incendiarism. The extent of it is one of the unfortunate results of the zeal of local agents for business and commissions.

Preventive Activity of Insurance Companies. While a part of the annual loss by fire must be charged against the system of insurance, insurance companies must, on the other hand, be credited with a large share of the responsibility for the discovery and application of methods for preventing such loss. Not only have they always been active both in the adoption of preventive measures and in compelling or inducing the insured to adopt such measures, but it is also to their initiative that a large part of the progress in State and municipal activity along the same lines has been due. As an example of direct preventive activity by fire-insurance companies themselves may be mentioned the maintenance of fire brigades and fire patrols. The early English companies laid great stress on the value of their services in extinguishing fires. Companies of "watermen," organized for this purpose, were supported at first by the individual companies and later by associations among the underwriters. It was not until 1866 that the maintenance and control of the London fire brigades passed from the hands of the underwriters to the municipalities. The English companies still support "salvage corps," whose duty it is to protect property from damage by fire or by the water used in extinguishing fires. Insurance companies in the United States have established organizations with duties similar to those of the English salvage corps. They are variously known as fire patrols, salvage corps, and protective associations. The earliest American association of that order was established in New York in 1839. Similar organizations are supported to-day by underwriters' associations in at least 30 of the larger American cities.

Of more importance than this direct preventive activity of insurance companies is the indirect influence which they exert through the pressure which they bring to bear on the insured. This pressure is exerted in some cases through the refusal of the company to accept the risk unless certain changes are made in the property which will lessen the danger of fire; more commonly through inserting in the policy that certain specified acts of the insured, of such a nature as to increase the risk, shall render the policy void, and almost universally by varying the premium rate in accordance with the number of preventive devices adopted by the insured. The introduction of automatic sprinklers into general use was directly due to such discrimination by insurance companies.

Fire Marshals. Finally, it is largely due to the agitation carried on by insurance companies that States and municipalities have adopted various measures for the purpose of preventing loss by fire. The more common forms of public action for this purpose are the maintenance of fire-extinguishing organizations, and the adoption of regulations concerning the storage of explosives and other dangerous commodities, and regulations as to the character of material to be used in the construction of buildings. A more recent movement in the same direction is the adoption of laws for the appointment of State fire marshals. Local fire marshals or other similar officers have long been maintained in the larger cities. The first State fire marshals were authorized by Massachusetts and Maryland in 1894. Their example was followed by Ohio (1900), Connecticut (1901), and Washington (1901). Since 1901 a number of other States have established the office of fire marshal, and systematic efforts have been made to bring about a uniformity of State laws on the subject. In 1902 Massachusetts transferred the duties of the fire marshal to the district police. In Mississippi the insurance commissioner acts as fire marshal. Along with the establishment of the office of fire marshal has gone the adoption of laws requiring investigation into the origin of fires. Maine and Pennsylvania, as well as the States mentioned above, require such official investigation. Much light will undoubtedly be thrown upon the causes of fires by these investigations, and more intelligent action will be possible for the purpose of diminishing their number and destructiveness.

The duty of State and municipality to adopt regulations for the purpose of minimizing fire losses is too obvious to need discussion. When the carelessness or misconduct of one individual may result in irreparable losses to others who have themselves taken all due precautions, the State is clearly justified in doing all in its power to ward off the danger. What municipalities have done is but a small part of what they might properly do, and what they may be expected to do as more enlightened views of their responsibility in the matter come to prevail.

Technique. The Risk. The proper business of insurance companies is not the prevention of loss by fire, but the assumption of risk. Through an insurance policy the risk to which the property of the insured is exposed is assumed by the insuring company. Insurance in itself may have no effect on the amount of property destroyed by fire, or upon the chance of destruction to which a particular piece of property is exposed. The gain conferred by insurance upon society arises partly from the reduction in the uncertainty as to how much loss will be suffered in a given period through the accumulation of a large number of risks, and partly from a distribution of the losses actually suffered among a large number of individuals. The risk which an insurance company assumes when it insures a piece of property against loss by fire depends upon several factors; viz., the value of the property insured, the probability of fire within a given time, the probable destructiveness of the fire if it occurs, and the length of time for which the insurance is granted. The first and last of these factors are determined with comparative ease and accuracy. The determination of the second and third, on the other hand, presents very great difficulty. So far as human intelligence is concerned, it is largely a matter of chance whether a particular building is visited by fire in a given year or not. The adoption of preventive measures may reduce the probability, but some degree of uncertainty will always remain. And when there is added to that uncertainty the uncertainty as to the extent of the loss occasioned by the fire, it will be seen that there is a large element of chance in the liability which the company assumes so far as any particular property is concerned. Moreover, the uncertainty is of such a nature that the chance of loss cannot be determined by the most careful examination of the property. The knowledge of the conditions affecting the possibility of fire is too imperfect to admit of such direct determination. It is necessary, therefore, to rely upon the statistics of past experience to show what chance of loss a particular risk brings upon the company. If statistics show that each year for a number of years fire has destroyed, upon the average, one out of every thousand buildings of a certain kind, there is one chance in a thousand that any particular building of the same character will be destroyed during the following year. The greater the number of cases from which the average is calculated, the more reliable is the average—i.e., the less danger is there that it has been unduly affected by temporary fluctuations in the number of fires. The experience of insurance companies themselves furnishes the most valuable data obtainable for calculating average losses. It is extremely desirable that the movement already under way to combine the experience of many companies, and thus calculate combined experience tables for fire insurance, as they have already been calculated for life insurance, should be carried out.

But even with the help of experience, the problem of calculating the risk incurred by insuring a particular building is by no means simple. In the first place, the probable destructiveness of the fire must be determined from experience as well as the probability of the occurrence of the fire. In the second place, the problem is made more complex from the fact that no two pieces of property present precisely the same fire features, if the term may be used. To group them in classes at all it is necessary to overlook many minor points which may still have some influence on the degree of risk. Even when this is done, the necessary number of classes is very great. The Home Insurance Company, which has kept a careful record of its fire experience during an existence of nearly 50 years, has found it necessary to make more than 150 classes of risks. The process of arranging risks in groups according to the chance of loss to which they are exposed is known as the classification of risks. It is a matter of great importance that this classification should be as accurate as possible. It is of importance to the companies, because a general underestimating of risks must result in loss to them; it is of importance to the insured, because imperfect classification means an unjust distribution of the burden of insurance. If any kind of property is put in a more hazardous class than it properly belongs in, the owners of that property contribute more than their share to the cost of insurance. Farmers, as a class, e.g., believe that farm property is thus unjustly classified by the large insurance companies, and that rates on such property are higher than they should be. It is that belief which is partly responsible for the spread of small mutual companies among them. The fire experience of these mutual companies lends some support to this claim.

The Policy. The terms of the insurance contract are set forth in the policy. In the early days of fire underwriting there was great diversity in the forms of policies, and considerable uncertainty in consequence as to their provisions. Underwriters' associations began early to urge the adoption of a common form of policy for fire insurance, and more recently the legislatures of the various States have taken the matter under consideration. Fifteen States now have laws describing the form of policy to be used in writing fire insurance within their borders. Massachusetts adopted a standard form in 1873, New Hampshire in 1885, New York in 1886. The other 12 States have since adopted the New York form, sometimes with minor variations. Moreover, the large companies have introduced the New York standard policy into many States where its use is not compulsory, so that a uniform policy is now written by them in nearly all parts of the United States. This policy contains, among other things, very clear and precise statements as to the limitation of the liability of the insurer, as to acts of the insured which will cause the policy to become void, and as to the necessary procedure by the insured in proving a claim to indemnity in case of loss. To give some degree of flexibility to the policy, a series of riders has been prepared, which the companies are in many States authorized to attach to the policy, and which thus become a part of the contract.

Termination of the Policy. A fire-insurance contract may be terminated in any one of four ways. It may be made void by the failure of the insured to live up to the conditions contained in the policy; the time for which the insurance is granted may expire, when all liability of the insurer ceases; the policy may be canceled at the request of either insurer or insured; or, finally, the insured property may be destroyed by fire and the payment of the indemnity by the insurer to the insured terminate the contractual relations between them. The first three methods are simple, and need no comment. Trouble arises only in the settlement of claims for indemnity. Not to speak of the somewhat elaborate formalities to be observed by the insured in proving the amount of loss he has suffered, disputes often arise as to the amount of the liability of the company. In States where there is no legal regulation prohibiting such an arrangement, the policy usually provides that the liability of the company shall be limited to the actual value of the property destroyed. Even in case of total loss the insurer cannot recover the total amount named in the face of his policy unless he can prove that his property at the time of the fire was worth that amount.

Valued-Policy Laws. Partly on account of the injustice involved in collecting premiums on a larger amount of insurance than the company is ready to pay even for a total loss, and partly because of the tendency to laxness in appraising property for insurance under this system, several States have passed so-called "valued-policy" laws. These laws do not apply to movable property, for reasons easily discerned. In the case of fixed or immovable property, valued-policy laws provide that, in the absence of fraud on the part of the insured, the company must pay the full amount of the face of the policy in case of total loss. In some States, however, allowance may be made for depreciation in the value of the property between the time of insurance and the time of loss; while in others allowance is made for any change in the property during that time of such a character as to increase the risk. Wisconsin was the first State to pass a valued-policy law, which it did in 1874. Nineteen other States and Territories have since passed similar laws. Several other legislatures have also passed them, only to have them vetoed by the governors. Of the eight bills passed during the years 1899–1901, no less than five were vetoed. Insurance companies have opposed the passage of such laws, and resisted them when passed, so far as possible. In the case of the Missouri law they went to the United States Supreme Court on the question of its constitutionality. The court declared it constitutional. In the absence of legislation, when the same property is insured in several companies, the insured can recover only the actual value of the property destroyed. The various companies pay such a part of the indemnity as the insurance they are carrying constitutes of the total amount of insurance on the property. In most States having valued-policy laws, however, the amount of insurance stated in the face of each policy must be paid in the case of total loss of immovable property.

Surplus Insurance. A special form of insurance known as surplus insurance is sometimes written. This is sold under the condition that the company granting it does not become liable for indemnity in case of fire, unless the loss of property is so great that the entire amount of regular insurance fails to cover it. Such surplus insurance is furnished at rates below those charged for regular insurance, since in most cases of partial loss the regular insurance is enough to cover the loss, and the company furnishing surplus insurance escapes liability.

Coinsurance. A large proportion of fires result in only partial losses to insured property. In the absence of any stipulation to the contrary, a partial loss must be paid in full, provided it does not exceed the amount of the insurance. There are two unfortunate results of this arrangement. One is that it increases the complexity of the calculation which an insurance company must make in estimating the risks it assumes. The other is that in the long run persons insuring their property for a small part of its value gain at the expense of those carrying insurance more nearly equal to the value of their property. If, e.g., of two similar pieces of property, each worth $10,000, one is insured for $4000 and the other for $8000, the premium paid by the owner of the former property is only one-half of that paid by the owner of the latter. If now each piece is damaged by fire to the extent of $3000, each owner recovers the full amount of the loss. The ratio of premium to indemnity is therefore twice as great in the one case as in the other. There are two possible remedies: The premium rate might be lowered as the ratio of insurance to value was increased, since the actual risk for $1000 insurance diminishes pari passu. A very different remedy is usually adopted, however, known as coinsurance. A coinsurance clause attached to a fire policy stipulates that the owner of insured property must insure for a certain percentage—usually 80 per cent—of its value; or, if he carries less insurance, must be held to be his own insurer for the difference between the amount carried and the 80 per cent. This provision has no effect upon the amount of the indemnity received in the case of total loss. In the case of partial loss, however, it does away with the discrimination in rates in favor of small insurance. To recur to the example already used, the two pieces of property, each worth $10,000, must, in accordance with the coinsurance clause, be insured for $8000. The owner who has only $4000 of insurance is considered to carry his own insurance for the other $4000. If the two pieces of property were totally destroyed, each owner would receive as indemnity the amount stated in the face of the policy, and the ratio of premium to indemnity would be the same in the two cases. If, on the other hand, each piece of property was damaged to the extent of $3000, the owner carrying only $4000 of insurance would receive but $1500 of indemnity, since, as self-insurer for one-half of the required 80 per cent, he must bear one-half the loss. The other owner, having insured his property for the full 80 per cent, would receive the full $3000 from the insurance company. In this way the ratio of premium to indemnity is made uniform in the two cases. The principle of coinsurance is that the entire property at risk should bear the burden of the loss of any part of it. It is a principle long familiar in marine insurance under the name of "average." It is applied to all fire-insurance policies issued in France, Germany, Belgium, and Russia. It is clearly in the interests of justice, since it brings about a more equitable distribution of the cost of insurance.

Anticoinsurance Legislation. In spite of all these facts, the attempt to introduce such a clause into fire-insurance policies in the United States has met with great opposition. It was first used to any extent in 1892, and as early as 1893 three States passed laws prohibiting its use. These States were Missouri, Tennessee, and Maine. (Maine repealed the law in 1895.) Similar laws have since been enacted by nine other States, in the following order: Louisiana, Iowa, Georgia, Indiana, Michigan, Minnesota, Wisconsin, Ohio, and New Jersey. The Ohio law, which was passed in 1896, was repealed in 1902, leaving 10 States with such laws still in force. To break down the opposition to the coinsurance clause, the companies have adopted a plan of offering insurance at a lower rate when the coinsurance clause is in the policy than when it is not. This they can afford to do, since the effect of the clause is to reduce the risk. Several States which prohibit coinsurance clauses under other circumstances authorize them when they are accompanied by a reduction of rates.

Governmental Regulations. The discussion of the advisability of government ownership and management of the insurance business belongs in the general article on INSURANCE. So far as fire insurance is concerned, there have been but few experiments in that direction. Such government fire-insurance offices as have been established, chiefly in Prussia and Switzerland, have operated over so small a territory that their experience is of little value. They have lacked one of the chief supports of an insurance office —the increased regularity in the proportion of losses to risks which results from bringing many risks together in one company. In all parts of the civilized world governmental supervision and regulation of private companies is the general rule in the insurance business. In the United States each individual State exercises supreme authority over the business within its own territory, as the national government has as yet made no attempt to regulate it. The result is a great deal of diversity in the laws to which companies operating in a large number of States are subjected. Nearly all these laws have been passed in the real or supposed interests of the insured. A few relating to taxation have been passed for the purpose of raising revenue. Reference has already been made to certain special laws in force in a comparatively small number of States, viz., anticompact laws, valued-policy laws, and anticoinsurance laws. It remains to notice a few of the more common provisions of the different States. In nearly all States it is necessary for a company desiring to do business within its borders to secure a license from the proper State official. In some States it is necessary for a company from without the State to make a deposit for the security of policy holders within the State. It is sometimes necessary for agents to secure licenses to solicit business within the State. In nearly all States companies are required to make annual reports and to submit to examination by the proper State official whenever he deems it necessary. In most States they are required to maintain a reserve sufficient to reinsure all outstanding risks. All States tax fire-insurance companies (certain mutual companies are exempted in some States), and sometimes a discrimination in taxation is made in favor of domestic companies against those from outside the State. In many States a "reciprocal" law is in force with regard to taxation and the conditions of entering the State—i.e., the law of the State provides that a company from any other State, desiring to enter its borders, must meet the same requirements as the State in which the company is chartered imposes upon other State companies. The great diversity of the regulations adopted by the different States points conclusively to the desirability of national control of the insurance business through congressional legislation.

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FIRE ISLAND BEACH, or GREAT SOUTH BEACH. A low spit of land, about 30 miles long, and from ¼ to ½ of a mile broad, which, with the shorter Oak Island Beach, to the west, incloses Great South Bay, on the southern coast of Long Island, N. Y. (Map: New York, G 5). Near its west extremity is a lighthouse of the first order, which has a flashing white light, 167 feet above mean high water and visible for 19 (nautical) miles; also a station from which transatlantic steamers bound for New York are first sighted. The beach is a popular summer resort. Margaret Fuller Ossoli, with her husband and child, perished by shipwreck on Fire Island in 1850.

FIRELESS COOKER. A device by means of which foods which have been thoroughly heated or partially cooked on the stove are kept hot a sufficiently long time to complete the cooking process. This is accomplished by providing a suitable covering of insulating material into which the cooking pot with its hot contents can be placed. Many types of fireless cooker are on the market, which, though like in principle, differ in the details of construction, the sort of insulating material used, and in similar ways. The common insulating materials are mineral wool and asbestos.

Fireless cookers which will give satisfactory results can be easily made at home, by using a box or chest of such size that the cooking pot can be surrounded with a layer about 6 inches thick of nonconducting material, such as hay, excelsior, or crumpled paper. A cushion of suitable size is placed over the top of the cooking pot, which should have straight sides and a tight-fitting cover, and the box closed with a tight-fitting lid. In such fireless cookers there is no source of heat excepting that derived from the preliminary cooking on the stove and retained in the hot material in the cooking pail.

Some of the commercial cookers have an extra source of heat, i.e., soapstone or iron plates which can be heated on the stove during the preliminary cooking and placed in the cooker under or over the cooking pot or both. This presupposes an insulating material and construction which cannot be set on fire by the hot plates.

Advantages claimed for the fireless cooker are economy of fuel, convenience, and economy of time. For instance, a housewife while getting breakfast can start the cookery of many of the dishes (meats, vegetables, etc.) needed for dinner or supper, place them hot in the fireless cooker, close it, and leave them without further attention. At dinner or supper time the foods can be warmed again if they have cooled below a temperature at which it is desired to serve them. See COOKERY.

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FIRELESS ENGINE. A form of steam or vapor engine which is detached from the heating apparatus, and which carries no fuel in process of combustion to generate heat. Dr. Emile Lamm, of New Orleans, invented, July 19, 1870, an engine in which the motive power was derived from the vapor of ammonia. The ammonia, as it escaped from the engine, was passed into a reservoir of water, in which it was absorbed; the water when heated to a temperature of about 135° F. gave up the ammonia as gas, which was returned to the engine to be used over again, and then again absorbed and returned as before. This engine was found efficient and economical for the movement of street cars. The use of ammonia was soon abandoned, steam taking its place. Water heated to 212° F. becomes vapor if the pressure upon it be no more than the usual atmospheric 15 pounds per square inch. If the pressure be greater, the water remains liquid until a higher temperature is reached, the temperature varying with the pressure according to well-known laws. If steam at a high pressure be admitted to water of low temperature and pressure in a closed vessel, the steam will be condensed in the water, but the pressure in the vessel will be increased, while the volume of the water will be enlarged by the volume of that derived from the condensed steam. The water thus becomes charged with steam condensed under high pressure, and when the pressure is relieved, a portion of the steam reverts to its condition of vapor and may be conducted in the usual way to a cylinder and piston, where it will do its customary work. The opening of the valves gives vent to the vapor, gradually reduces the pressure, and relieves the condensed steam; so that a tank, filled with water and stored with many times its volume of uncondensed steam, will furnish motive power sufficient to move the engine and a considerable train of cars for a trip of several miles. On its return the tank is connected with a stationary boiler from which it receives a fresh supply of steam. It will not be forgotten that the real force of the steam is due to the heat which it contains, and that if the heat be lost, by radiation or otherwise, from the tank containing the condensed steam, its potential energy is so much reduced. In the engine used at New Orleans the mechanism was that of an ordinary locomotive minus its fire box, having a water tank instead of a boiler; the appliances for stopping, starting, and backing were as usual. The tank was about 6 feet long and 3 feet in diameter, covered thickly with felt and wood to retain its heat. Steam was taken until the gauge indicated 135 to 150 pounds, the temperature for 135 pounds being 353°. With this accumulation of power the machine ran 5 to 7 miles before the pressure was reduced to 60 pounds. The labor and care of firing are avoided on one of these engines, and they offer no danger from sparks from a chimney stack or hot ashes and coal from an ash pit of a furnace. They have been made unnecessary by the coming in of the compressed-air locomotive and the various systems of electric traction. They were never economical.

FIRELOCK. A firearm introduced about 1690, the charge of which was ignited by the concussion of flint and steel. The *matchlock* previously in use required a lighted match at the powder pan. See SMALL ARMS.

FIREN′ZE. See FLORENCE.

FIRENZE, ANDREA DA. See CICCIONE.

FIRENZUOLA, fē′rĕn-zwô′lȧ, AGNOLO, or ANGIOLO, GIOVANNINI (1493–c.1546). An Italian writer, remembered chiefly for the idiomatic elegance of his language and for his spirited translation of *The Golden Ass* of Apuleius. He was born at Florence, studied law at Siena and Perugia, and in spite of a gay life, to which he was ever faithful, he finally joined the Brotherhood of Vallombrosa. He rose to considerable influence in Rome, where he had gone to practice law, and Clement VII, who freed him from his monastic vows, assured him sufficient income to admit his exclusive devotion to literature in Florence. Firenzuola's works include two comedies, a dialogue, *Delle bellezze delle donne,* a eulogy upon the charms of women; *Discorsi degli animali,* the basis of which was probably a Spanish descendant of the Sanskrit book of fables known as the *Pančatantra* (q.v.); and the *Ragionamenti,* a collection of *novelle* written in imitation of the *Decameron.* For biography, consult: Bianchi's edition of Firenzuola's works (Florence, 1848); that of Guerrini, *Novelle di Firenzuola* (ib., 1886); M. Rosai, *L'Asino d'oro di Agnolo Firenzuola* (Città di Castello, 1901).

FIRE OPAL. See OPAL.

FIREPLACE. See HEATING AND VENTILATION.

FIREPROOF BUILDING. See FIREPROOF CONSTRUCTION.

FIREPROOF CONSTRUCTION. Fireproof buildings have been defined as those constructed with walls of brick, stone, terra cotta, concrete, iron, or steel, in which wood beams or lintels are not placed, and in which the floors and roofs are constructed as below outlined. According to the most approved codes the stairs and staircase landings must be built entirely of brick, stone, Portland cement, concrete, iron, or steel. No woodwork or other inflammable material shall be used in any of the partitions, furrings, or ceilings in any fireproof buildings, excepting, however, that when the height of the building does not exceed 12 stories, or more than 150 feet, the doors and windows and their frames, the trims, the casings, the interior finish when filled solid at the back with fireproof material, and the floor boards and sleepers directly thereunder may be of wood, but the space between the sleepers shall be solidly filled with fireproof materials and extend up to the underside of the floor boards. When the height of a fireproof building exceeds 12 stories, or is more than 150 feet, the floor surfaces shall be of stone, cement, rock, asphalt, tiling, or similar incombustible material, or the sleepers and floors may be of wood treated by some approved process to render the same fireproof. All outside window frames and sash shall be of metal or of wood covered with metal. The inside window frames and sash, doors, trim, and other interior finish may be of wood covered with metal, or of wood treated by some approved process to render the same fireproof. All hall partitions or permanent partitions between rooms in fireproof buildings shall be built of fireproof material and shall not be started on wooden sills or on wooden floor boards, but be built on the fireproof construction of the floor and extend to the fireproof beam filling above. The tops of all doors and window openings in such partitions shall be at least 12 inches below the ceiling line.

Fireproof floors shall be constructed with steel floor beams so arranged as to spacing and length of beams that the load to be supported by them, together with the weights of the materials used in the construction of the said floors, shall not cause a greater deflection of the said beams than $\frac{1}{30}$ of an inch per foot of span under the total load, and they shall be tied together at intervals of not more than eight times the depth of the beam. Between the beams shall be placed brick arches springing from the lower flange; or hollow tile arches of hard-burnt clay or porous terra cotta of uniform density and hardness of burn; or arches of Portland cement concrete, segmental in form, which shall have a rise of not less than 1¾ inches for each foot of span between the beams; or between the said beams may be placed solid or hollow burnt-clay, stone, brick, or concrete slabs in flat or curved shapes, concrete, or other fireproof composition, and any of said materials may be used in combination with wire cloth, expanded metal, wire strands, or wrought-iron or steel bars; but in any such construction, and as a precedent condition to the same being used, tests shall be made.

No filling of any kind which may be injured by frost shall be placed between the floor beams during freezing weather; and if the filling is so placed during any winter month, it shall be temporarily covered with suitable material for protection from being frozen. On top of any arch, lintel, or other device which does not extend to and from a horizontal line with the top of the floor beams, cinder concrete or other suitable fireproof material shall be placed to fill up solidly the space to a level with the top of the floor beams and shall be carried to the underside of the wood floor boards in case such be used. All fireproof floor systems shall be of sufficient strength to safely carry the load to be imposed thereon without straining the material in any case beyond its safe working strength. The bottom flanges of all floor beams and flat roof beams, and all exposed portions of such beams below the abutments of the floor arches, shall be entirely incased with hard-burnt clay, porous terra cotta, or other fireproof material allowed to be used for the filling between the beams, to which such incasing material shall be properly secured. The exposed sides and bottom plates or flanges of girders supporting floor beams, or supporting floor arches or floors, shall be entirely incased in the same manner. After the floors are constructed no opening greater than 8 inches square shall be cut through said floors unless properly boxed or framed around with iron. And such openings shall be filled in with fireproof material after the pipes or conduits are in place. All columns, including the lugs and brackets on same, used in the interior of any fireproof building, or used to support any fireproof floor, shall be protected with not less than two inches of fireproof material, securely applied. The extreme outer edge of lugs, brackets, and similar supporting metal may project to within ⅞ of an inch of the surface of the fireproofing.

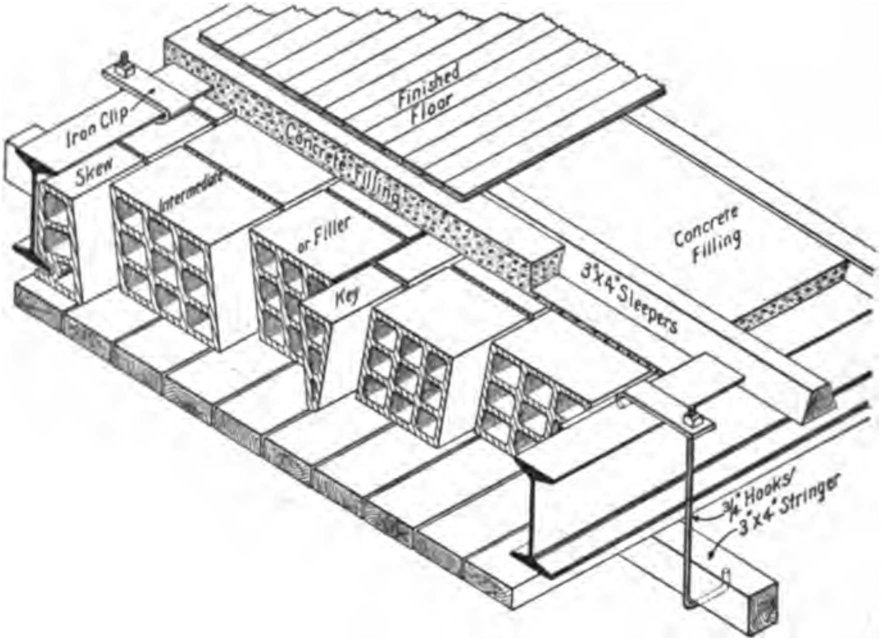


FIG. 1. FLAT FLOOR ARCH (SIDE-METHOD CONSTRUCTION).

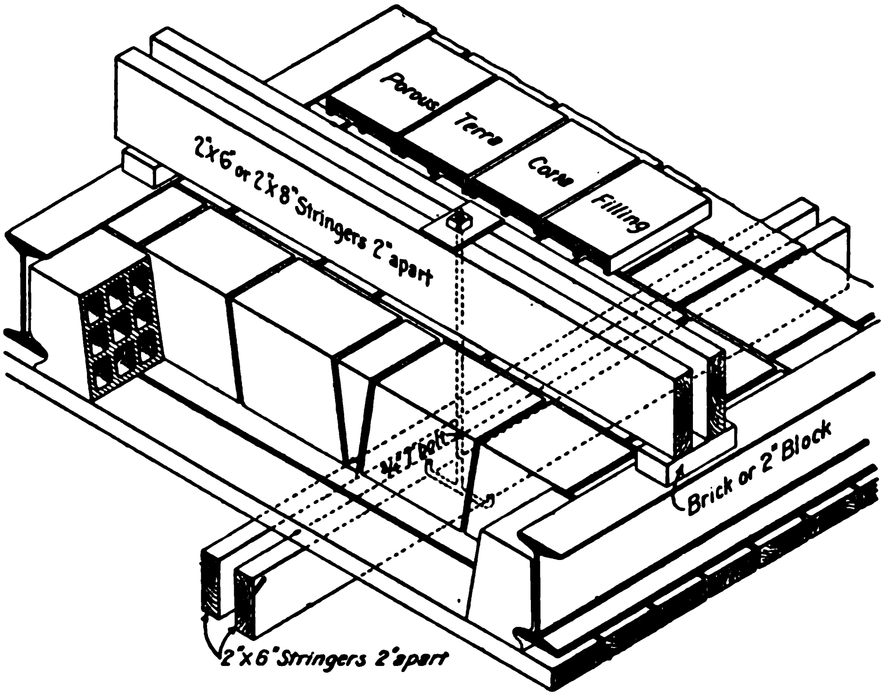


FIG. 2. FLAT FLOOR ARCH (END-METHOD CONSTRUCTION).

Materials. The systematic study of fireproof or fire-resisting construction used in such building as above described is a development of comparatively recent years. Various materials have been employed from time to time for the purpose of making buildings fireproof. Cast and wrought iron, steel, stone, terra cotta, plaster, mortar, and concrete are the materials in most general use. Experience has shown, however, that the only practicable way to build a really fireproof building is to use nothing but incombustible materials for its structural parts, and to protect any of those materials which are injuriously affected by heat, such as iron and steel, by some fire, water, and heat-resisting material. An ideal fireproof building would be one constructed entirely of bricks and terra cotta, with brick or terra-cotta floors and roofs, built in the form of vaults sprung from brick piers, so that no metal work would be needed for structural purposes. Such a building, if properly designed and built, would withstand the combined action of all of the elements for centuries, but it would naturally require thick walls and heavy piers.

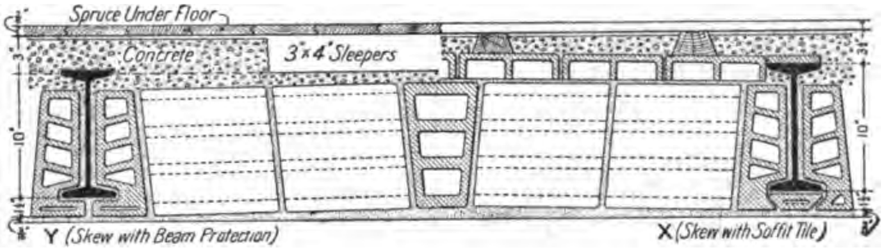


Fig. 3. FLAT FLOOR ARCH (COMBINATION-METHOD CONSTRUCTION).

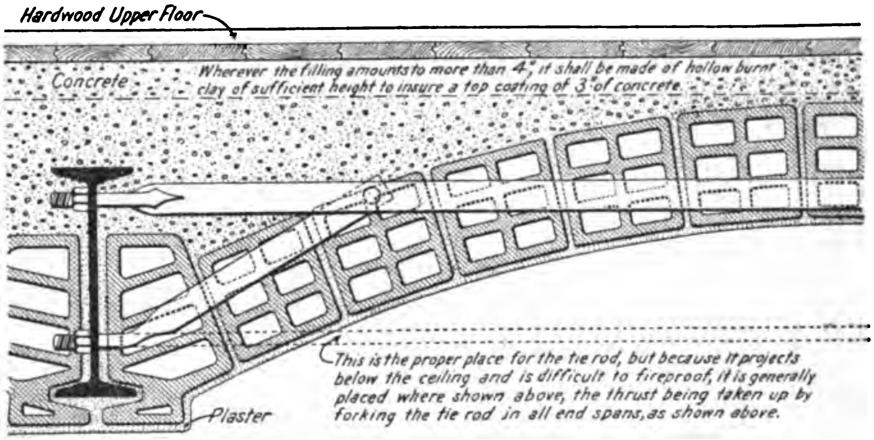

Hardwood Upper Floor
Concrete
Wherever the filling amounts to more than 4", it shall be made of hollow burnt clay of sufficient height to insure a top coating of 3" of concrete.
This is the proper place for the tie rod, but because it projects below the ceiling and is difficult to fireproof, it is generally placed where shown above, the thrust being taken up by forking the tie rod in all end spans, as shown above.
Plaster

Fig. 4. SEGMENTAL ARCH.

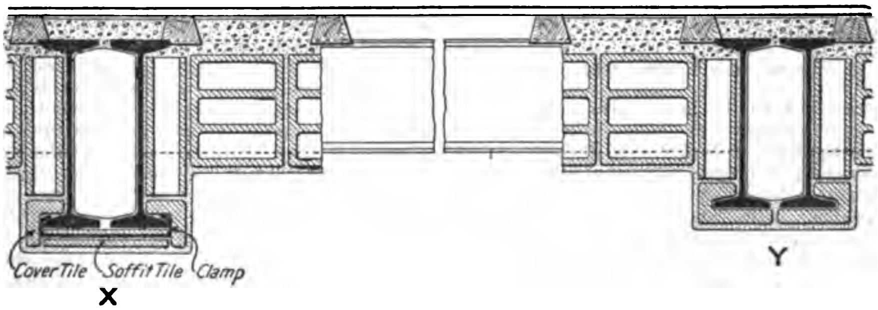


Fig. 5. GIRDER PROTECTION.

Practical considerations, however, call for the utmost economy in space, and for this reason columns and other vertical supports must be as small and as far apart as possible, and floors must be thin and have level ceilings; these can be obtained only by using metal for the structural parts, protecting it from direct exposure to fire or heat by some fire-resisting material. While design and construction are important elements in making a building fireproof, yet, so far as the structure of a modern steel-frame fireproof building is concerned, it may be desirable to consider it apart from the present article and under the head of STEEL SKELETON CONSTRUCTION (q.v.), in which the engineering and other structural problems involved in the design of a modern skyscraper or other city building are discussed, leaving for the present article the form and the method of the protection which must be applied to the main structure. Of all fire-resisting materials probably burnt clay has the widest application in fireproof building, for it is an excellent nonconductor, and having once passed through the ordeal of fire it is practically indestructible. For the construction of floors and partitions and for the protection of columns and girders, the clay is molded into hollow blocks or tiles of suitable shapes.

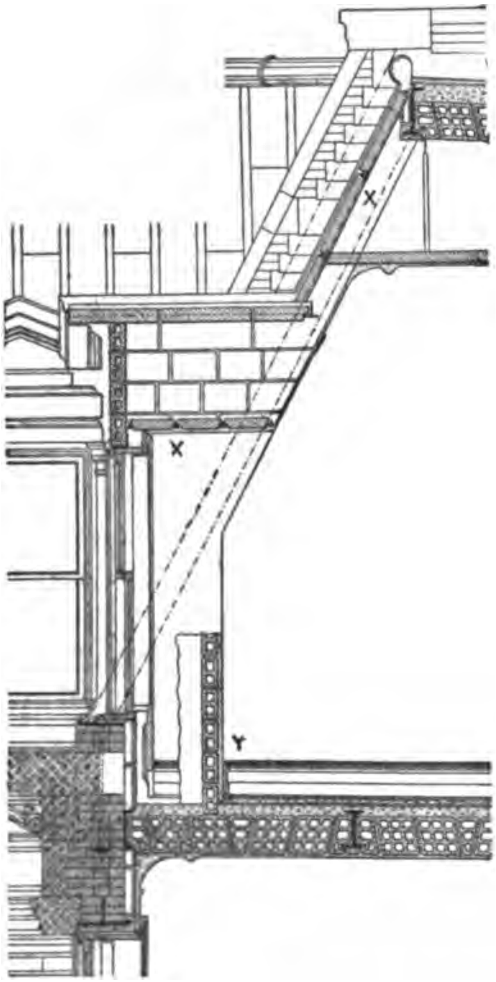


FIG. 6. ROOF CONSTRUCTION.

Three kinds of terra cotta are used for making blocks—porous, semiporous or semiglazed, and dense or glazed. Each has its own particular field of usefulness.

Porous terra cotta is made by mixing about one-third, in bulk, of finely cut straw or sawdust with fine clay, which, after being tempered and molded, is burnt under a high heat, causing the combustion of the straw or sawdust and leaving the material in a porous state like pumice stone. It will not crack or break from unequal heating or sudden cooling, it can be cut easily and is soft enough to allow the driving in of nails or screws for securing the interior trim, and it is elastic, tough, and light and nonheat-conducting in itself, so that it can be made in solid as well as in hollow blocks. Because of these properties it is generally used for interior partitions, for column and girder protection, and for furrings generally; but it is not used in the construction of outside walls or where excessive dampness occurs because it is absorbent, nor is it suitable for floor construction on account of its lack of strength.

In the manufacture of semiporous or semiglazed terra cotta, a smaller percentage of sawdust is used, or finely screened boiler cinders are substituted instead. The result is a material slightly more porous than the best grade of brick, but still not so soft as the ordinary porous terra cotta. Semiporous terra cotta is used largely for floor construction, for column and girder protection, and for the building of outside walls.

Dense or glazed terra cotta is made generally of some natural fire clay without the addition of any combustible material. The only ingredients added are low grades of clay, crushed bricks, or terra cotta, or sand, to prevent excessive shrinkage. Dense terra cotta cannot be cut without breaking; it is brittle and liable to failure under sudden shocks. In places where suddenly applied loads are expected, porous material should be used, but under static loads dense terra cotta is better than porous, being stronger; and because it is also cheaper it is very generally used for floor construction. On account of its nonabsorbent qualities it is largely employed for building exterior walls, the blocks being grooved or scored to provide a key for the stucco, as there is not sufficient suction to hold the stucco on the smooth glazed surface. Dense tiles, because of their brittle nature, require wooden grounds and nailing strips, which detract from their fireproof qualities, so they are not used for interior partitions, furrings, or column protections.

Floor Arches. Hollow tile floors may be built of flat arches (Fig. 1) or of segmental arches (Fig. 4). Flat hollow tile arches are made of two "skews," or "skewbacks," resting against the web of the beams and fitting around the lower flanges, one "key," or "centre block," and "fillers," "part fillers," or "intermediates," as they are variously designated, sufficient in number to fill the spaces between the skewbacks and the key. A safe rule for finding the proper depth of the arch in inches is to multiply the span in feet by 1¼ inches and add the thickness of the protection below the beams. The blocks are divided into hollow spaces by interior webs or partitions from 3 to 4 inches apart, the number depending upon the size of the block. The lower flanges of the beams carrying the floors should be covered with at least 1½ inches of fireproofing. To accomplish this, the skews are made either with a bevel on the bottom to receive a protection tile for the beam (as shown at X, Fig. 3), or with the protection burnt upon the skew itself (as shown at Y). The former is more generally used because it is easier to make. In manufacturing the skew with the beam protection burnt on the block, it is difficult to keep the flanges straight; during drying and burning they frequently become so warped as to break off when placed on the beam, and in addition the projection is liable to be broken off in careless handling.

There are three general types of flat arched floors used in modern fireproof buildings. The first and oldest is known as the "side-method construction," in which the tiles are set side by side between the beams (as shown in Fig. 1). In the second type, known as the "end-method construction," the blocks run at right angles to the beams abutting end to end (as shown in Fig. 2). The third type is a combination of the first and second, the skewback and the key being made as in the side method, and the fillers abutting end to end between them, as in the end method (as shown in Fig. 3). So far as absolute strength is concerned, the end method is about 50 per cent stronger than the side method. The objections to the end-method arch are, it is wasteful of mortar and it is difficult to bed properly the edges of the blocks. Also, as there is no bond between the rows of blocks, if a single block in a row becomes broken or is knocked out of place, the entire row may fall, and for the same reason a single block cannot be omitted for making a temporary hole as may be done in the side-method arch. Notwithstanding these objections the end-method arch, being just as cheap and much stronger for the same weight, has largely superseded the side-method arch.

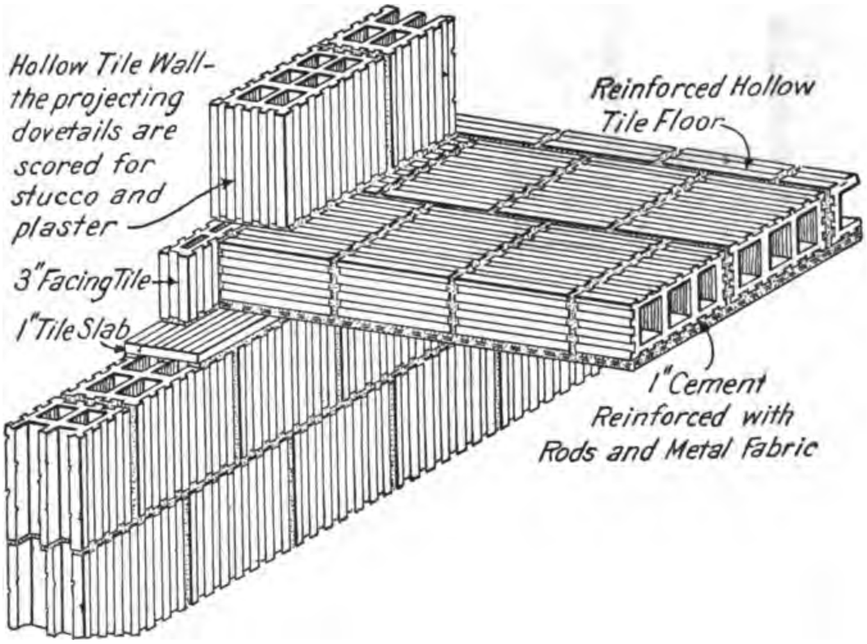

Hollow Tile Wall-the projecting dovetails are scored for stucco and plaster
Reinforced Hollow Tile Floor
3" Facing Tile
1" Tile Slab
1" Cement Reinforced with Rods and Metal Fabric

Fig. 7. WALL CONSTRUCTION.

Where a flat ceiling is not essential, and for warehouses, factories, and buildings of a similar character, the segmental arch (shown in Fig. 4) makes the strongest, cheapest, and best fireproof floor that can be built of hollow terra cotta; but on account of the arched ceiling resulting from its employment, its use has generally been limited to the buildings above mentioned. Segmental arches are always made after the side-method construction.

Girder Protection. Girders projecting below the ceiling line are especially exposed to the effects of fire and water as intense heat is brought to bear on the corners of the protection and the streams from the fire hose tend to tear it off, so that they should be provided with not less than 2 inches of terra cotta. In general it may be said that the protection in which stability depends upon the use of metal clamps or anchors (as shown in *X*, Fig. 5) is not so efficient as that in which the soffit protection holds its position independently of them (as in *Y*).

Roof Arches. Nearly all fireproof buildings have flat roofs, pitched just enough to cause water to run to the lowest point, as it is easier to make a flat roof thoroughly fireproof than a pitched roof. The usual and also the best method of constructing flat roofs is to lay the beams with the required pitch and then build the roof in the same way as the floor. Where the ceiling is suspended (as shown in Fig. 6), segmental arches may be used. Pitched roofs are generally covered with 2 or 3 inch porous terra-cotta tiles (shown at *X* in Fig. 6), called book tiles, because the joints resemble the backs and edges of a book. They are set on the flanges of light T-irons spaced the proper distance on centres.

Walls and Partitions. Since about 1908 hollow tile blocks have been largely used for building the outside walls of dwellings and of other buildings of moderate height. The wall blocks are made of semiporous or dense material, 8, 10, and 12 inches thick and 12 inches high, and are scored on all sides to provide a key for the plaster (as shown in Fig. 7). They are always set with the voids or cells running vertically and with the joints broken in each course. Special blocks are made for corners and also for sills, joints, and lintels. A special form of floor construction used in connection with these walls is also shown in Fig. 7. Interior partitions are built of brick-shaped hollow blocks (as shown in *Y*, Fig. 6), a 4-inch thick block being used in most cases.

Column Covering. The most common form of column protection consists of a layer of 2 or 3 inch hollow partition blocks (shown in Fig. 8), laid against a solid backing of concrete or tiles, where the blocks do not bear against the column. Consideration of appearance, or the amount of floor space to be occupied, is frequently allowed to influence unduly the shape or size of the fireproofing material for columns to the detriment of the protection and often leads to the use of very thin solid slabs, which should not be permitted. The Chicago Building Ordinance is very explicit in its requirements for the protection of columns and is a good guide to follow in all cases. It is: "The covering of columns shall be of brick not less than 8 inches thick, or of two consecutive layers of hollow tiles [Fig. 9], not less than 2½ inches thick, or of two layers of porous terra cotta not less than 2 inches thick each. Whether hollow tile or porous terra cotta is used, the two consecutive layers shall be so applied that neither the vertical nor the horizontal joints in the same shall be opposite each other, and each course shall be so bonded and anchored within itself as to form an independent and stable structure. In places where there is trucking, or wheeling, or other handling of packages, the lower 5 feet of the fireproofing shall be incased in a protective covering of sheet iron 1 inch away from it, with the space filled in with mortar [*X*, Fig. 8], or of oak slats [*Y*], or of angle irons set at the corners and tied together with iron bands."

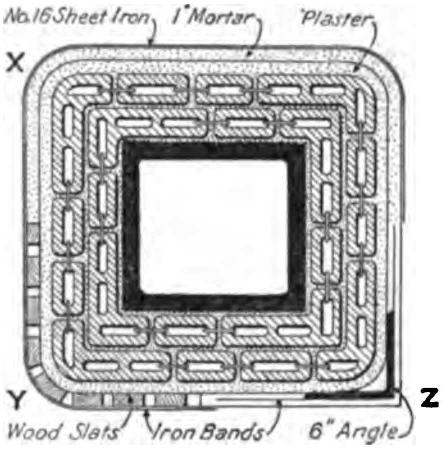


FIG. 8. COLUMN PROTECTION.

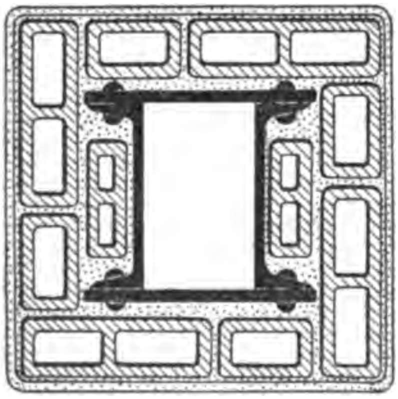


FIG. 9. COLUMN PROTECTION.

Other Fireproof Materials. Next to terra cotta, concrete and plaster are the most commonly used materials for fireproofing. Concrete floor arches are shown in Figs. 10 and 11. For further description of these systems, see section on *Reënforced Concrete* in article CONCRETE. Partitions are frequently built of reënforced concrete, and so are column coverings. Reënforced concrete is naturally a fire-resisting material, and reënforced-concrete structures are essentially fireproof and safe if their construction is attended with proper precautions, and especially if proper materials are selected for the concrete itself, so that it can resist the high temperatures which may be experienced. To secure the best results with reënforced concrete from the standpoint of fire protection, it is, of course, necessary to make sure that the areas of the concrete floor arches are restricted, the bearing columns and reënforcement are adequate, and the design is such as to provide against failure in case any individual portion of the structure becomes unduly heated. Plaster, in the form of blocks, is also used for building interior partitions. For further description, see article on PLASTER; also that on FIRE PROTECTION, MUNICIPAL.

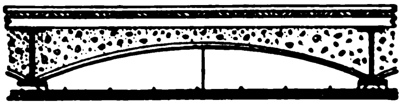


FIG. 10. REËNFORCED CONCRETE ARCH.

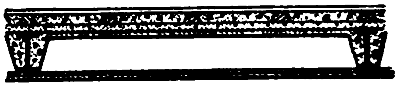


FIG. 11. EXPANDED METAL CONCRETE ARCH.

Bibliography. Consult volumes of the various engineering papers for the last 10 years. Among the books which may be consulted are: Freitag, *Fire Prevention and Protection* (New York, 1912); Birkmire, *The Planning and Construction of High Office Buildings* (ib., 1898); Kidder, *Building Construction*, part i, "Masons' Work" (ib., 1896); Fuller, *Fireproof Building Construction* (ib., 1904); Moore, *Fire Insurance and How to Build* (ib., 1903); Kidder, *Building Construction and Superintendence* (9th ed., ib., 1913); id., *Architects' and Builders' Pocket Book* (ib., 1914). See ARCHITECTURE; CONCRETE; FOUNDATION; FIRE PROTECTION, MUNICIPAL; STEEL SKELETON CONSTRUCTION.

FIREPROOFING. The coating or impregnation of combustible materials, such as textile fabrics and wood, with chemical preparations so as to prevent their burning either partially or entirely. Such substances for the most part act by coating the material with a crust of mineral matter on the surface of the fibres that serves to prevent the combustion, but does not interfere with decomposition. Cotton and linen may be steeped in certain saline solutions such as alum, ammonium chloride, ammonium phosphate, borax, zinc sulphate, and sodium tungstate, in order to render them uninflammable. Preparations of these salts in various combinations and proportions find extensive use in the treatment of canvas used for scenery in theatres, and in many places it is required by law that the drop curtain at least shall be fireproof. Papers that are both fireproof and waterproof may be made from a pulp consisting of vegetable fibre to which asbestos and salts, such as alum and borax, in suitable proportions, have been added. The Perkin Non-Flam Process, an English process of fireproofing cotton fabrics, consists in impregnating the material with a solution of sodium stannate of 1.22 sp. gr., drying thoroughly, and further treating with an ammonium sulphate solution of about 1.75 sp. gr. Stannic oxide is precipitated in the fabric. Sodium sulphate is also formed, and is removed by washing. The material is then ready for drying and finishing. It is claimed that the fireproofing is so permanent that the fabric can be washed repeatedly.

For the impregnating of timber to make it fire-resistant and uninflammable, numerous processes have been proposed. As deliquescent salts cannot be used, and certain compounds like sodium silicate cannot be made to penetrate the wood satisfactorily, treatment of the timber in practice has been limited to ammonium salts such as sulphate and phosphate, and aluminium and ferric sulphates.

Fairly good fire-resistant results are at times obtained by means of so-called fireproof paints. These include paints in which sodium silicate and zinc chloride have been incorporated. Dense coatings of whitewash have considerable fire-resistant value and with the addition of silicate of soda are often used. See FIREPROOF CONSTRUCTION.

FIREPROOF SAFES. See SAFES AND SAFE DEPOSIT VAULTS.

FIRE PROTECTION, MUNICIPAL. The protection of a community against sudden outbreaks of fire and the restriction of such fires to the narrowest possible limits is a function that usually by common consent is assumed by the local government, though it may be supplanted by private organizations where such are especially required. To deal with the emergencies involved in an outbreak of fire sudden and rapid efforts are required, and there is involved a certain amount of organization and equipment, as well as disciplined men. Such discipline must be practically military, since where a fire department is called to act there must be no confusion or hesitation, as no other work requires greater promptness, both in reaching the scene of action and in taking the necessary measures to check the outbreak.

In most municipalities the fire-protection service—or fire department, as it is usually termed—includes the fire alarm and telegraph, the fire engines and other apparatus, and men organized and trained to a degree rarely, if ever, found in other departments of municipal service. The water works, which naturally are an integral feature of any scheme of fire protection, more usually are under separate organization. (See WATER WORKS.) In European cities the fire department may be directly under military organization, or it may be composed of soldiers and sailors who have seen military service and are under the control of retired officers, thus maintaining all the characteristics of an active military organization.

In the United States the fire departments are exclusively civil and local and are marked by varying degrees of efficiency and discipline, but in practically all there are traditions of loyalty and personal heroism which not only act for the good of the department and general effectiveness, but render it the pride of the citizens of the municipality. In fact such service is considered highly honorable and carries with it the same immunities as militia duty.

The problem in an American or Canadian city is quite different from that in Europe, where the buildings are usually of stone and where building regulation, both for sound construction and maintenance, has been in force for many years. In the United States and Canada, where the growth of cities has been rapid and wood has been the usual material on account of its cheapness and availability, large cities of inflammable character have grown up, and various practices, due to carelessness and lack of foresight, have prevailed which entail an enormous annual fire loss.

While the true function of a fire department is to prevent fires and confine them to as narrow an area as possible, in America the fire department has been called upon to deal not only with occasional and sporadic outbreaks, but with large conflagrations, and the public at large has been apt to consider a fire department's efficiency as consisting in its ability to handle a large conflagration rather than its ability to restrict a fire to its point of origin and prevent fires by adequate inspection and suitable rules and regulations in coöperation with building and other departments. Vast sums annually are appropriated for fire protection, and in many cases they are not even commensurate with the hazards which exist in the various cities. Of recent years the problem of fire prevention has been brought before the general public by insurance authorities and municipal officials, so that its importance is realized as never previously, and efficient inspection and suitable regulations are no longer considered infringements of individual rights, but as necessary to the safety and welfare of the community. Accordingly the safety requirements of building departments are being increased, and often the intervals between fires are being utilized by having uniformed members of the fire department inspect various buildings with an idea to detecting violations of rules and regulations and improper conditions, as well as becoming acquainted with the character of the buildings in the districts where they serve.

While it cannot be said that satisfactory methods and organization for fire prevention universally have been adopted in the United States and Canada, yet there has been great improvement, and various laws and regulations in addition to the requirements of insurance companies are bringing about better conditions. In many States, as a result of recent legislation, there are State fire marshals, who supplement efforts of local officials when they are lax or when such supervision is absent altogether, and their powers vary in kind and degree. Methods of fire prevention involve not only the protection of property, but the increased safety of life, especially in public buildings and institutions, and where throngs of people are congregated for purposes of business or amusement; thus, the detailing of firemen to theatres and other auditoriums and the supervision of fire drills are usual practices in large cities.

The fire department may be considered under the heads of *personnel* and *matériel*. In all cities there should be an organized and uniformed force, which may be, in the case of the smaller places, a skeleton organization reënforced on an alarm by call men, but for all large cities a full and permanent organization should be constantly on duty. In towns and villages it may be possible to get along with a so-called volunteer department; but even here, under modern conditions and with motor apparatus, it is the growing tendency to have at least a few trained men instantly available for answering an alarm and seeing that the apparatus is started immediately for the outbreak. In most American cities admission to the fire department comes through civil-service examinations, where the physical qualifications as well as the general intelligence of the candidate are tested by strict examinations. The candidate accepted becomes a probationer, being attached to a fire company for ordinary service with it and in addition attending special probation classes, where he is put through a course of instruction in the use of life-saving appliances, ladders, hooks and axes, hose, and the various tools forming the equipment of the fire company. Here he is trained effectively to take his place in the ranks and, at the end of the probationary period, may receive a regular appointment.

The tendency towards formal and practical instruction is growing in American fire departments, and the city of New York maintains a fire college, where not only probationers, but firemen of all ranks, receive practical and theoretical instruction on which examination must be passed as a condition of reaching a higher grade. This recent feature, though not so completely organized, has been followed in several of the more progressive fire departments in the United States, while many fire officials of high rank have gone to New York to benefit from such instruction.

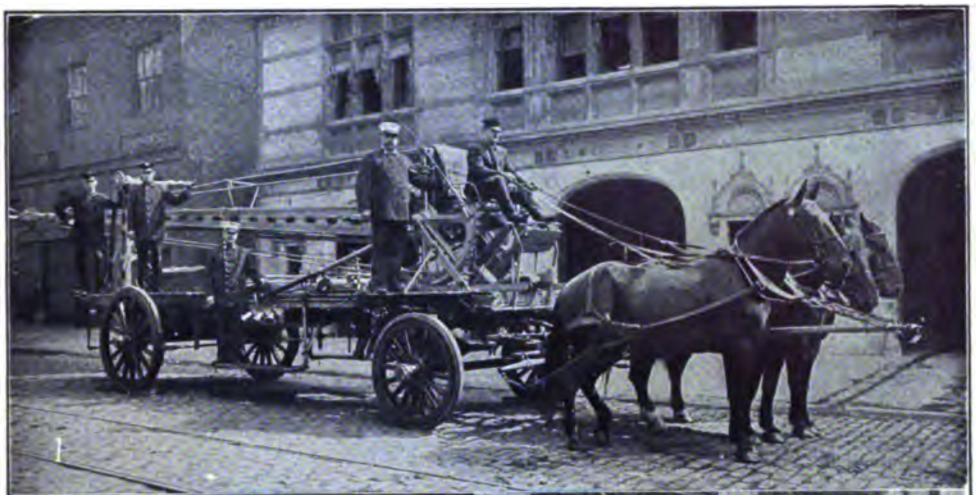
The ordinary organization of a fire department consists of a chief, assisted by one or more deputies, or assistants, and sometimes by chief engineers who pay particular attention to the apparatus and equipment. If the size of the city warrants, it is divided into divisions, each under a deputy chief, and into battalions, each under a battalion chief. A battalion is made up of a number of companies, including fire engines and hose companies, hook and ladder companies, chemical engines, water towers, searchlight and special companies, as may be required, while the insurance interests may maintain patrol or salvage corps, which also respond to alarms. A company usually includes fire engine and hose tender, with a crew of from 6 to 12 men, a majority of whom are constantly on duty, or a hook and ladder truck with the same complement, other units, or companies, being manned according to their needs. In charge of each company is usually a captain, or foreman, with one or more assistant foremen, or lieutenants, the designation being different in the case of the various departments. There is usually a grade of engineer, possibly that of chauffeur, or automobile driver, and one, two, or three grades of firemen. The firemen are responsible for the care and maintenance of the apparatus, as well as its service, and with the growing use of more complicated apparatus their work is becoming more serious and responsible as well as requiring an unusual degree of intelligence. The use of motor apparatus involves technical training, as this apparatus is both expensive and delicate and must receive the best of care, especially under the severe conditions of service required in a fire department. The fireman usually serves a certain number of years, when he is retired on a pension; and the best fire departments in the United States are those where the organization and discipline are the least subject to political interference.

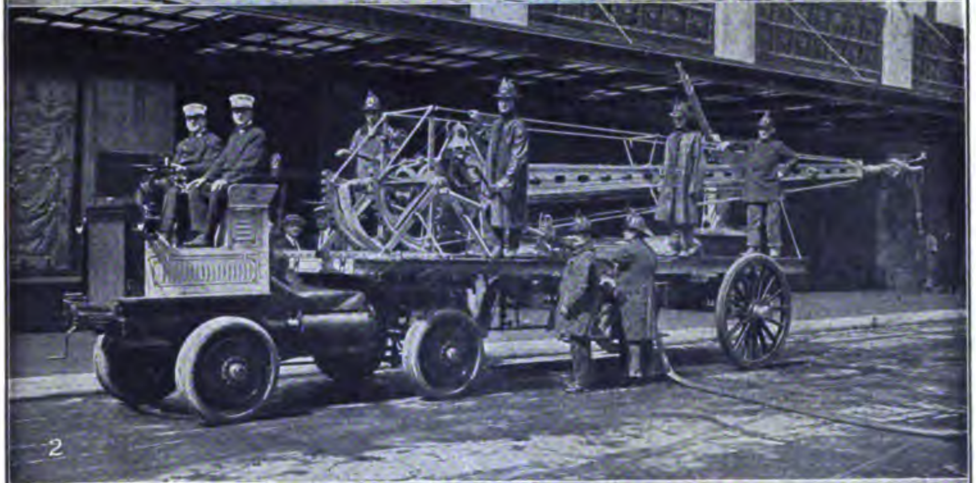
The permanent force may be under the head of a commissioner, director, or superintendent, appointed or elected, who may devote his entire attention to a fire department, or in connection with other departments, usually of public safety. He is rarely expected to have a professional knowledge of fire fighting or fire problems.

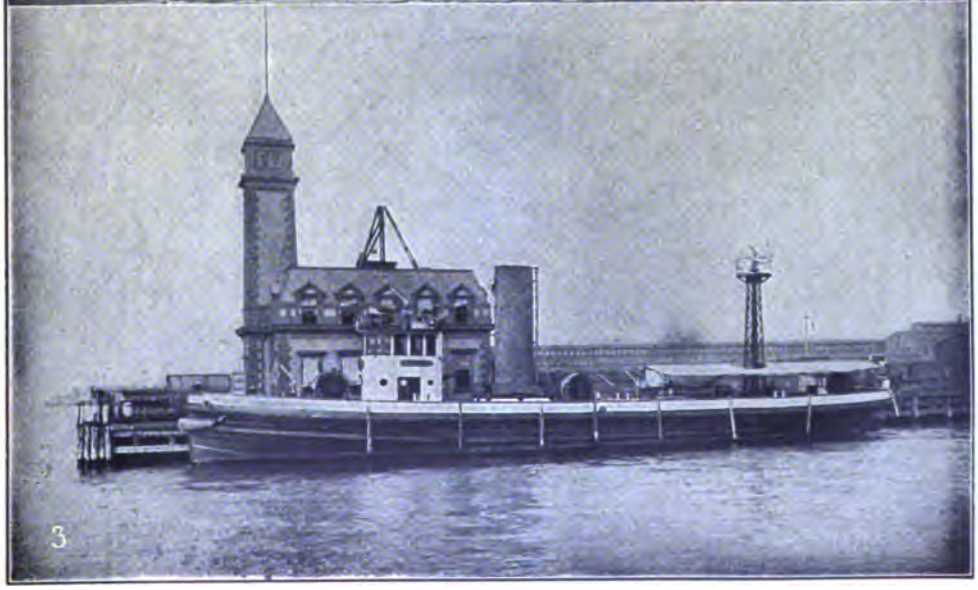
A trained fireman must know what to do at once when he reaches the scene of the fire, and often such a man with a few simple appliances is able to stop what might prove a disastrous blaze. It is for this reason that emphasis is laid on the rapid transportation of men and apparatus to the outbreak on an alarm, and for this reason various appliances to facilitate the starting of the apparatus, to give increased speed of travel on road or pavement, and secure readiness of use and application at the fire, have received and still receive considerable attention from the better organized fire departments. Opinions of experts vary as to the necessity for responding to every alarm with a complete and adequate equipment. In some American cities, especially on a telephone alarm, a single fireman is sent immediately with a portable extinguisher on a motor cycle, as with such equipment he is often able to deal with a blazing curtain, chimney fire, or other small outbreak, while for a more serious occasion he may turn in an alarm for the necessary number of companies. In other cases high-speed motor cars carrying several extinguishers or chemical hose and tanks answer immediately, and in certain cities scout companies, or flying squadrons, are sent in advance of the engine companies to anticipate more serious trouble. In some larger cities, such as New York, however, each regular alarm brings sufficient companies to deal with any ordinary serious fire on the premises; and while in the majority of cases their services are not needed, yet they are available, and New York fire-department officials are adverse to taking any chances.

The equipment of a fire department, especially in a country with conditions such as exist in the United States and Canada, is second only to an adequate and efficient *personnel*. The first element to be considered is the water supply and its availability, as this, naturally, is the most important consideration, both as regards quantity and pressure, which must be sufficient, not only for normal occasions, but for the conflagration which in most American cities is no impossible contingency. With hydrants located in sufficient proximity to any possible point of fire and with an adequate water pressure and supply, the question is in large part solved, and there is no need of elaborate fire engines or

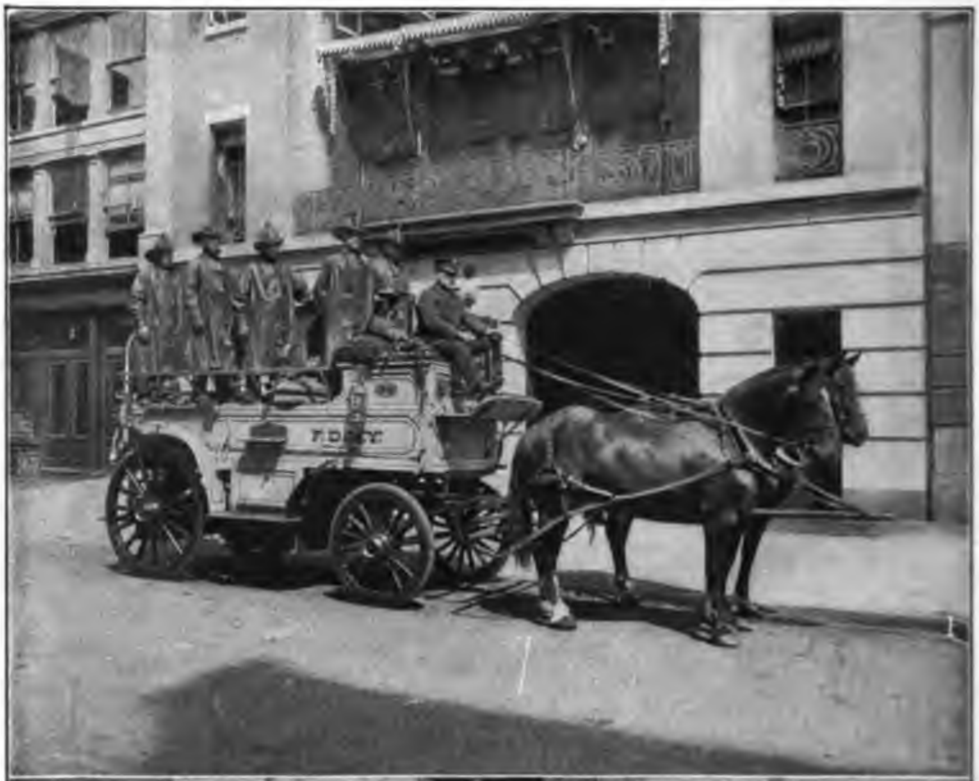
FIRE PROTECTION

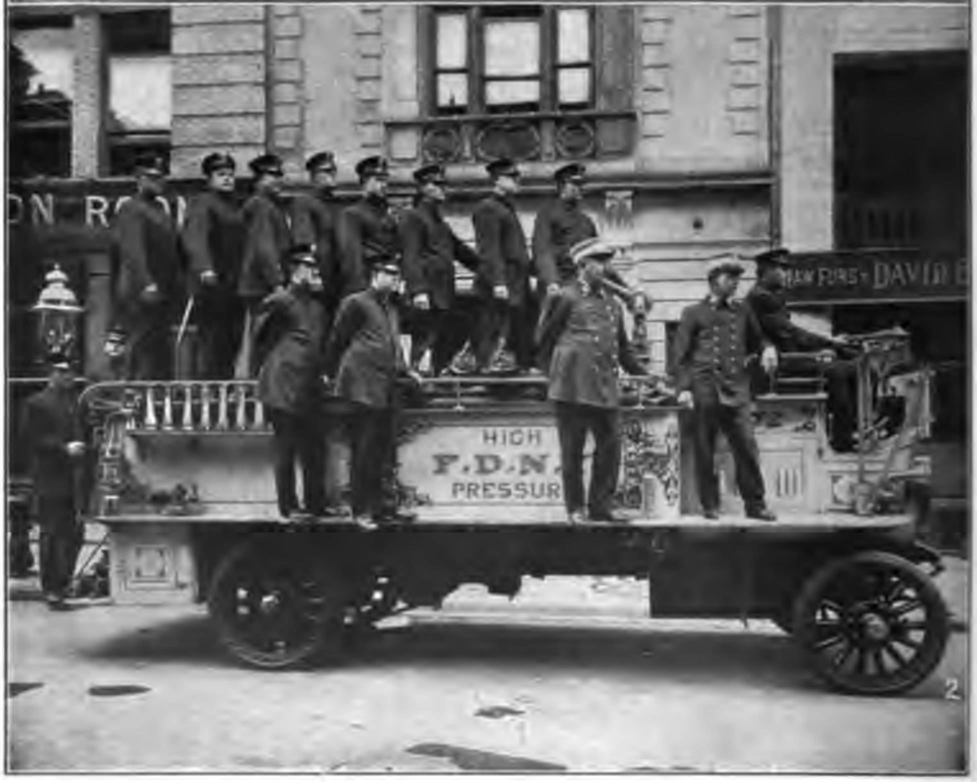






1. HORSE-DRAWN WATER TOWER
2. WATER TOWER WITH COUPLE-GEAR TRACTOR
3. NEW YORK FIRE DEPARTMENT FIRE BOAT





HIGH-PRESSURE HOSE COMPANIES

1. HORSE-DRAWN HOSE TENDER, NEW YORK FIRE DEPARTMENT
2. TYPICAL MOTOR TENDER FOR CARRYING HEAVY HIGH-PRESSURE HOSE AND APPLIANCES

other portable pumping apparatus, as their function is simply to insure the delivery of adequate water at a desired point. Accordingly many cities are laid out with this end in view, having water mains and plumbing fixtures designed and constructed so as to withstand the high pressures. In other cases independent high-pressure fire mains are laid, which are maintained constantly under a pressure, or such a pressure may be put on the system by pumps at a central station which can be started immediately on receipt of an alarm of fire. This tendency towards high pressures is shown both in rural communities and in the larger cities, many of the latter maintaining independent high-pressure water systems for fire purposes exclusively, especially with lake or salt water from the water front available as an unlimited supply. The first notable installation of this kind was in Philadelphia, where in 1904 there was installed a system into which water could be pumped from the Schuylkill River. The pumps of this system are gas-driven, using the ordinary illuminating gas from the city mains, and the system was so effective that it was subsequently extended and increased. In New York City there was installed in 1908 a high-pressure service where fresh water from the ordinary service can be pumped through an independent system of pressure mains from central pumping stations in which are located electrically driven centrifugal pumps that can be started instantly on receipt of an alarm. In emergency or failure salt water from the river front can be pumped through the system instead of the fresh water of the city supply. This system has proved most useful and gradually is being extended to cover the entire business portion of the city. In Baltimore, also, a high-pressure system was installed in 1912 which was unique in that the hydrants were not of the customary form located at the curb, but were placed in manholes, and required a special portable head which the firemen carried in the hose tender and which must be fitted to the outlets before the hose could be attached and the regulating mechanism and valves used. In San Francisco, as a result of the great fire of 1907, a reconstruction of the water works was deemed necessary, and not only were gravity reservoirs maintained to supply pressure, but a large pumping station with oil-burning steam engines was erected, by means of which salt water from the bay could be forced through the mains under pressure. Other cities, especially on the Great Lakes, have utilized such systems, and often where there are no stations, or as supplemental to independent pumping stations, the powerful pumps of a fire boat can be connected.

Logically the high-pressure service is the solution of the water and pumping question in fire protection, as greater pressures can be delivered from the hydrants than from portable fire engines, and also a greater supply of water can be concentrated on any single district than any reasonable number of fire engines could pump. Accordingly, with the growth of such a system, the portable fire engine must be eliminated in the more closely settled cities, and such fire engines as are employed be designed to deal immediately with an incipient outbreak. Furthermore, the high-pressure system is particularly available where there are tall buildings, as its pressure enables a fire to be fought by the use of permanent standpipes of neighboring structures or of the building itself.

The nature and function of the fire engine in its different forms of development are considered elsewhere, but mention should be made of the equipment of the modern fire engine which motorization has made possible. A fire chief at Newton, Mass., in 1903 was the first to use a motor, and the same year the first motor-drawn chemical engine was installed at New London, Conn. Motor-propelled apparatus has now demonstrated its economy, usefulness, and reliability, and is being installed in place of horse-drawn machines practically everywhere. The provision of such apparatus for the model fire department at the Panama-Pacific International Exposition of 1915 may be considered as settling any previous doubts on this subject. A small motor-pumping fire engine carries usually two 40-gallon chemical tanks with 200 feet of chemical hose as well as a supply of fire hose for use with the pumps. It should carry also axes, hooks, pikes, and scaling ladders, so that, sent out to answer an alarm immediately, it should deal effectively with any small outbreak, as one or two trained men can often command the situation at once.

Whatever the source of water, whether it be a high-pressure system, a steam fire engine, or a motor-pumping engine, hose of strength and durability is required in adequate amounts. For the transporting of this hose a hose tender, formerly drawn by horses, but now practically universally with all new equipment self-propelled, is required. This vehicle may carry the heavy 3-inch hose of great strength required for a high-pressure service arranged in 50-foot lengths with heavy bronze coupling between the lengths, or the smaller hose for fire engines which is much easier for the firemen to handle if it will deliver sufficient water. The hose is made of the finest grades of Sea Island cotton, coated with rubber within and without, and must pass a rigorous inspection. The pressure to which it is subjected must be in excess of any ordinary use, and usually representatives of the insurance interests are present at such tests, while the material and method of construction may be subject to the approval of a technical laboratory and duly labeled or stamped with the approval of the inspecting bureau. Considerable progress has been made recently in the attempt to secure standard and uniform hose couplings, so that not only can all the hose of a single fire department be available for all conditions of service, but where a department is reënforced by apparatus from a neighboring city the hose connections can be used directly either with hydrants or other hose. A serious difficulty in the use of hose is the fact that the pressure diminishes very rapidly through interior friction, and accordingly when the lines are laid care should be taken to have them as direct as possible. The water is delivered from the hose through a nozzle or play pipe, which is of metal, tapering from the size of the hose to that demanded by the desired size of stream which ranges from 1 inch to 2½ or 3 inches, the latter being the size of orifice of a large play pipe when several lines of hose are Siamesed together to secure a maximum volume of water. The nozzle may have a control valve enabling the firemen to shut off the stream. while there may be also relief valves on either the hydrant or at the fire engine, so that the pressure may be suitably relieved without the danger of bursting the hose or making the nozzle difficult to handle.

In connection with high-pressure practice a suitable regulating valve is required at the hydrant in order that an individual stream may be controlled irrespective of the general action of the pumps or what may be demanded at other points. Various forms of nozzles are used, such as for cellar fires, where through a hole chopped in the floor a stream may be directed in any desired direction and a large volume of water delivered. With high-pressure lines a tripod or other stand is often used, as otherwise it is difficult for several men to control the nozzle through which a heavy stream is being delivered. Monitor or turret nozzles are often arranged on hose tenders and fire boats, as well as on the base of a water tower, thus insuring stability and enabling the stream to be directed properly.

The water tower is a valuable portion of the equipment of a fire department, especially with tall buildings, and was developed to deal with fires in high buildings before the skyscraper epoch. The water tower is a truck carrying an elevated nozzle which may be swung from a horizontal position to the vertical and then extended to a height of about 65 feet, enabling a stream to be delivered against or into a building from without. Several lines of hose can be connected at the base of the water tower, while the standpipe can be changed in direction at will or raised or lowered. The water tower has the further advantage over hose of the smoother interior surface cutting down the friction. Of course, in buildings of 20 or 30 stories in height the water tower is not available, and such fires must be fought from within the structure with the local protection afforded by the pumps and fire lines of the building. The modern water tower is now motor-driven by some form of powerful tractor, several of those in the New York City fire department being fitted with a gas-electric tractor with power at each of the four wheels, which is substituted for the front wheels and horse-draft gear of the older machines.

The hook-and-ladder truck has also been materially improved within recent years. Like the water tower, the aërial ladder, which could be extended to a height of 85 feet, furnished a serious problem for a team of three horses to draw in winter with snow or ice on the pavement. The horses now have been supplanted by some form of motor mechanism, either as a tractor or applied directly to each of the wheels of the ladder truck. In New York City front-drive tractors have been used for hook-and-ladder trucks, as well as couple-gear gas electric machines where the power is delivered to a motor at each of the four wheels. In other cities storage batteries have been used with success, while various other forms of tractors have been employed, and also automobile engines with a long shaft working directly on the rear wheels. The aërial ladder truck is usually mounted on a turntable and trunnions over the front wheels and can be extended either by hand or power, the various applications differing in different types. In one form an electric motor is used to elevate the ladder and send up the fly ladder to its full height. In another a system of springs performs this function, while in still another type gas is generated for this purpose. The hook-and-ladder truck carries, in addition to the main extension ladder, other ladders which can be leaned against the side of the building, pompier or scaling ladders, hooks, pikes, door openers, roof cutters, axes, life-saving nets, and other tools used by the firemen. It is steered by a tillerman as well as by the driver controlling the motor.

The hose wagon, or tender, varies in design with the amount of hose to be carried. It is usually an efficient form of automobile truck capable of a speed of 40 miles an hour and holding as much hose as may be needed. It carries the necessary nozzles and other tools, usually mounts a turret nozzle behind the driver's seat, and two or more chemical extinguishers. The firemen are transported on the hose tender.

Searchlight companies have been organized in the New York fire department, where a portable engine and dynamo supply current for a powerful projection apparatus which can illuminate any desired portion of the scene of operation.

The modern fire house is being gradually improved and with the advent of motor apparatus partakes less of the character of a stable. It is considered good economy to install a double company in a single house, and often a fire-engine company and hook-and-ladder truck occupy the same building, which is usually two or three stories in height. The men sleep on the upper floors, and brass sliding poles pass through the house, enabling the men to reach the main floor and apparatus in the quickest possible time when the alarm strikes. With a horse company the alarm not only sounds, but releases the chains in front of the horses' stalls, opens the doors, and, if it is night, turns on all the lights in the house automatically, this latter performance being customary, naturally, in motor companies also. The harnesses are suspended above the horses, and a few buckles only must be snapped to enable them to proceed on their way.

The fireman makes use of numerous minor devices in his work. A scaling or pompier ladder, consisting of a wooden pole with a metal toothed hook at the top and crosspieces for climbing, is very useful in enabling him to climb from one window to another of a building. Life nets, which are circular affairs of rope, are used as a final resort for those who must jump from a burning building and serve a useful purpose where the distance is not too great. Life guns, by which a cord may be shot in the air, are also useful in carrying up a life line by which a rope can be hauled up and made fast by a person otherwise cut off. Respirators and smoke protectors are used extensively in Europe, but have not found as wide application in the United States, where firemen are now waiting for a satisfactory device to be developed. They consist of a filter of wet sponge, cotton, or other material, or some device enabling oxygen to be breathed, fastened over the mouth and nose to prevent suffocation. Numerous devices more or less patterned on a diver's helmet are also in use.

The modern fire department must be self-contained, with adequate facilities for repairing its apparatus and taking care of any emergency. In many cities the policy of standardization is followed, whereby the apparatus and its parts are interchangeable, and devices may be replaced at once from a common store.

Supplementing municipal-government fire services, private fire departments have been found necessary in many large industrial establishments. These consist usually in the organization of the employees so that each will take an appointed station with or without apparatus on an alarm of fire, and the provision of simple and suitable appliances sufficient to deal with any local or incipient outbreak of fire. To further such organization there are generally provided special fire pumps in the engine room, an independent system of fire mains fed from these pumps or from gravity tanks on the roof and with frequent hose outlets near which suitable hose wound on accessible reels is provided. In addition there may be various chemical tanks, tarpaulins to cover goods likely to be damaged by water, axes, buckets, ladders, and other appliances. Fire drills, in order to secure the prompt evacuation of the building by the employees and also to protect property and extinguish fire, are frequently held, and the advantage consists not only in increased safety, but often in reduced insurance premiums. Private fire departments are maintained also by many railway companies, especially for the freight yards, and on the Pennsylvania Railroad an elaborate fire-protection system is arranged with pumps and hose on switching engines and a code of signals to announce an alarm. In large skyscrapers the fire problem is also attacked in similar fashion, and while these buildings are fireproof, yet it is necessary to provide for the protection of the contents, which are usually combustible to a greater or less degree. Hose and standpipes, extinguishers, hooks, axes, as well as alarm boxes, are to be found on every floor, with a complete sprinkler system in many mercantile and office buildings as well as in industrial establishments, and the janitorial force is drilled to act promptly in an emergency. One elevator is always held in readiness for the use of the firemen, as the carrying of their heavy hose up a number of flights is no small undertaking. Private fire protection is becoming almost as important as that given by the local government, and with buildings of increased size and housing of many occupants, as well as large amounts of goods, it is a problem of no small importance.

Bibliography. The most useful sources of information in connection with fire protection are the reports made by such organized bodies as the National Board of Underwriters and the British Fire Prevention Committee. In the case of the publication of the National Board specific reports on the leading American cities are made from time to time and discuss in detail the character of the protection furnished by the various fire departments. The *Quarterly* of the National Fire Protection Association also contains useful information, as do the files of the engineering and insurance press and such papers as *Fire and Water Engineering*, *Municipal Engineering*, *Safety Engineering*, and *Municipal Journal*. Among the works in this field that may be consulted are the following: Shaw, *Fire Protection* (London, 1877), a British presentation of the subject; Hill, *Fighting a Fire* (New York, 1897); Croker, *Fire Protection* (ib., 1913), a timely discussion of fire dangers and the methods of resisting them; Kenlon, *Fires and Fire Fighting* (ib., 1913); O'Reilly (ed.), *Fires and Fire Fighting* (ib., 1911), a simple technical manual for firemen; McKeon, *Fire Prevention* (ib., 1912); Freitag, *Fire Prevention and Fire Protection* (ib., 1912); *Cyclopædia of Fire Prevention and Insurance* (Chicago, 1912); Crosley and Fiske, *Handbook of Fire Protection* (5th ed., Louisville, 1914).

FIRE QUARTERS. See FIRE BILL.

FIRES, GREAT CONFLAGRATIONS AND DISASTERS. From a remote antiquity, wherever men have grouped themselves in communities, fire has proved a source of destruction to life and property, second only to war and disease. Such disasters have not disappeared entirely with the development of civilization and the improved methods of building, maintenance, and dealing with outbreaks of fire. That such is the case may be testified by such conflagrations as those of Baltimore in 1904, San Francisco in 1906, the great Idaho forest fires in 1910, and the Triangle factory fire in New York City, of 1911, where the loss of life was great although the fire itself was confined to the building in which it originated. The fires more notable for the amount of property destroyed and loss of life, of which there is historical record, are given in the accompanying summary on page 604.

FIRE SALAMANDER. The common spotted species of salamander in Europe. See SALAMANDER.

FIRE SHIP, or **FIRE RAFT.** A floating craft, loaded with combustibles, set on fire and sent among the enemy's ships for the purpose of destroying them by fire or causing confusion. The first recorded use of fire ships was at the siege of Tyre (332 B.C.), the Tyrians delaying for some months the fall of their city by destroying with fire ships a mole that Alexander was building. There are numerous other instances of their use before the commencement of the Christian era, and they seem to have been well known from that time onward. The invention of Greek fire in 673 caused increased use of fire ships, at first by the Greeks and afterward by other nations as they became possessed of the secret of manufacture of the compound. In 951, and again in 953, Russian fleets narrowly escaped destruction by fire ships. During the period of the Crusades their use was frequent. In 1370 the English used them at Zuruckzee. The most notable use of them in early modern history, and the first known use of exploding vessels, occurred at the siege of Antwerp in 1585. They were both used against a heavy boom defense, but the employment of the exploding vessels was disastrous to their own side. The English used fire ships against the Spanish Armada at Calais with good effect in 1588. During the seventeenth and eighteenth centuries their use attained a maximum. Soon after the beginning of the nineteenth century the decadence of fire ships began, and the development of steam and the change from wood to iron in shipbuilding have nearly destroyed their usefulness.

FIRE WALK. In several of the Polynesian Islands, notably at Tahiti, is found a fire ceremony intended to insure good crops. Divested of its spectacular features, the ceremony consists of the walking of a priest and other celebrants barefoot across a bed of stones which have been heated upon a mass of burning wood. That this surprising feat, which has been described as a marvel, is susceptible of a rational explanation, has been shown by Secretary S. P. Langley, of the Smithsonian Institution, who observed the ceremony at Tahiti in 1901. It was ascertained that the volcanic rock employed is a poor conductor of heat, so that while the stones of the ceremonial "taro oven" may be intensely hot underneath, the upper part will be only moderately warm. (See *Nature*, Aug. 22, 1901.) A similar ceremony has been practiced in Japan. The stories bordering on the marvelous which have been told about ordeals by fire (see ORDEALS) will be found, on examination by competent observers, to admit of simple explanation.

A somewhat analogous mode of procedure has

TABLE OF THE MORE IMPORTANT CONFLAGRATIONS AND FIRES, SHOWING THE EXTENT OF PROPERTY DESTRUCTION AND LOSS OF LIFE.*

Date	Month and day	City	State	Destruction	Loss of life	Loss of property
59	....	Lyons	......	Total		
64	July 19-24	Rome	......	Five-sevenths city		
70	....	Jerusalem	......	Burned by Titus	1,100,000	
1137	....	York	England	Total		
1212	....	London	England	Nearly all from north to south	3,000	$20,000,000
1405	....	Bern	Switzerland	718 buildings		
1491	....	Dresden	Saxony	Destroyed		
1631	May 10	Magdeburg	Saxony	Nearly destroyed	20,000	
1666	Sept. 2-6	London	England	89 churches, 13,200 houses, 400 streets	6	60,000,000
1702	March 11	Boston	Mass.	100 buildings	....	2,000,000
1711	Oct. 2	Boston	Mass.	1,000 buildings	....	500,000
1728	....	Copenhagen	Denmark	1,650 houses, 5 churches, university, and 4 colleges		
1729	....	Constantinople	Turkey	12,000 bldgs.	7,000	
1736	Aug. 12	St. Petersburg	Russia	2,000 buildings		
1744	....	Brest	France	Magazines and stores	....	35,000,000
1750	Jan. 24	Constantinople	Turkey	12,000 buildings	....	15,000,000
1752	June 3-6	Moscow	Russia	18,000 buildings		
1756	....	Cairo	Egypt	50 mosques, etc.	300	40,000,000
1772	Aug. 21	Smyrna	Asia Minor	7,000 buildings	....	20,000,000
1794	March 1	Copenhagen	Denmark	Royal palace, etc.	100	23,000,000
1805	Nov. 22	St. Thomas Island	West Indies	900 warehouses	....	30,000,000
1811	Dec. 26	Richmond	Va.	Theatre	70	
1812	Sept. 15	Moscow	Russia	30,800 buildings	20,000	150,000,000
1820	Jan. 10	Savannah	Ga.	463 buildings	....	8,000,000
1822	Jan. 24	Philadelphia	Pa.	Orphan asylum	23	50,000
1835	Dec. 16	New York	N. Y.	530 buildings	....	20,000,000
1836	Feb. 14	St. Petersburg	Russia	Lehmann's Theatre and Circus	About 800	
1837	Jan. 13	St. John	N. B.	115 houses and business section	....	5,000,000
1842	May 5-7	Hamburg	Germany	4,219 buildings	....	35,000,000
1845	April 10	Pittsburgh	Pa.	1,100 buildings	....	10,000,000
1845	May 25	Canton	China	....	1,670	
1845	May 28	Quebec	P. Q.	1,500 buildings	20	4,000,000
1845	June 28	Quebec	P. Q.	1,300 buildings	40	8,000,000
1845	July 20	New York	N. Y.	300 buildings	6	6,000,000
1846	June 12	St. John's	Newfoundland	6,000 homeless	....	5,000,000
1846	June 14	Quebec	P. Q.	Theatre Royal	About 100	2,000,000
1847	Feb. 28	Carlsruhe	Germany	Theatre	63	1,500,000
1848	Aug. 16	Constantinople	Turkey	3,000 buildings	....	15,000,000
1848	Aug. 17	Albany	N. Y.	600 buildings, steamship pier, etc.	....	5,000,000
1848	Sept. 9	Brooklyn	N. Y.	300 buildings		
1849	May 17	St. Louis	Mo.	15 blocks, 23 steamships	....	7,000,000
1852	July 8	Montreal	P. Q.	1,200 buildings	....	5,000,000
1852	Nov. 2	Sacramento	Cal.	Total, 20,000 homeless	....	5,000,000
1854	Oct. 5	Gateshead	England	Warehouses	50	5,000,000
1857	June 7	Leghorn	Italy	Teatro degli Aquidotii	40 to 100	
1860	Jan. 10	Lawrence	Mass.	Pemberton Mill	500	
1861	June 21	London	England	Wharves, etc.	....	10,000,000
1862	May 10	Troy	N. Y.	671 buildings	....	3,000,000
1863	Dec. 8	Santiago	Chile	Jesuit church	2,000	
1866	July 4	Portland	Me.	One-half city, 2,000 homeless	....	10,000,000
1869	Aug. 4	Philadelphia	Pa.	Bonded warehouses with whisky	....	3,500,000
1870	June 5	Constantinople	Turkey	7,000 buildings	....	25,000,000
1871	Sept. and Oct.	Forest fires, Mich., Wis., and Minn.	......	750 square miles, 17,430 buildings	....	11,000,000
1871	Oct. 9	Chicago	Ill.	2,000 acres, 776 buildings	250	165,000,000
1872	May	Tientsin	China	Theatre	600	
1872	Nov. 9	Boston	Mass.	65 acres	....	75,000,000
1876	Sept. 3	St. Hyacinthe	P. Q.	Nearly destroyed	....	15,000,000
1876	Dec. 5	Brooklyn	N. Y.	Conway's Theatre	283	
1877	June 21	St. John	N. B.	Two-fifths city	....	15,000,000
1881	March 23	Nice	France	Théâtre Municipal	70	
1881	Dec. 8	Vienna	Austria	Ring Theatre	450	
1882	Dec. 11	Kingston	Jamaica	600 houses and wharves	....	10,000,000
1883	Jan. 13	Berditscheff	Russian Poland	Theatre	270	
1887	May 25	Paris	France	Opéra Comique	70 to 100	
1887	Sept. 5	Exeter	England	Exeter Theatre	86	
1888	March 31	Oporto	Portugal	Theatre	170	
1889	June 6	Seattle	Wash.	Business section	....	6,626,000
1892	July 8	St. John's	Newfoundland	Greater part of city	....	25,000,000
1892	Oct. 28	Milwaukee	Wis.	600 buildings	....	4,944,300
1896	Oct. 5	Guayaquil	Ecuador	Half of city	....	22,000,000
1897	May 4	Paris	France	Charity Basar	124	
1900	June 30	Hoboken	N. J.	Steamship piers and vessels	215	4,627,000
1900	April 26	Ottawa and Hull	Ontario	About two square miles	....	15,000,000
1901	May 3	Jacksonville	Fla.	148 blocks	....	10,500,000
1902	Feb. 9	Paterson	N. J.	456 buildings	....	5,817,305
1903	Dec. 30	Chicago	Ill.	Iroquois Theatre	574	
1904	Feb. 7	Baltimore	Md.	140 acres, 2,500 buildings	....	50,000,000
1904	April 20	Toronto	Ontario	14 acres leveled, 8 more damaged	....	12,000,000
1906	April 18	San Francisco	Cal.	2,593 acres (4.05 square miles)	....	350,000,000
1908	April 12	Chelsea	Mass.	492 acres	....	6,000,000
1911	March 29	Albany	N. Y.	Capitol	....	5,500,000
1911	March 25	New York	N. Y.	Triangle shirt-waist factory	147	
1911	July 10-12	Porcupine District	Ontario	Mining and lumber property	400	3,500,000
1911	April 30	Bangor	Me.	Conflagration	....	3,500,000
1912	Jan. 9	New York	N. Y.	Equitable Building	....	3,000,000
1912	Feb. 21	Houston	Tex.	Cotton compresses and other bldgs.	....	4,500,000
1914	June 25-6	Salem	Mass.	1,700 buildings, 253 acres	....	14,000,000

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* The figures in this table must be regarded in many cases merely as approximate, as an accurate statement of property destruction and loss of life is rarely forthcoming even in the case of modern conflagrations, not to mention those of which there exist only historical records. The statistics given, however, are useful as fixing the dates and comparative destruction of some of the world's great disasters by fire.

been noted among a number of North American Indian tribes. A fire is built, the glowing coals are spread, and the dancers then begin to dance, rushing into the fire and stamping it out. This performance has been described by the Prince of Wied, *Reise in das innere Nord-America*, ii, pp. 144, 218, 241 (2 vols., Coblenz, 1839–41), as the "Hot Dance" of the Mandan, Arikara, and Hidatsa. Among the Arapaho and Gros Ventre it has been noted as part of the Crazy Dance ceremony in Kroeber, "The Arapaho," *Bulletin of the American Museum of Natural History*, XVIII, p. 190; id., "Ethnology of the Gros Ventre," *Anthropological Papers of the American Museum of Natural History*, i, p. 245.

FIREWEED. See EPILOBIUM.

FIREWORKS. See PYROTECHNY.

FIREWORM. A caterpillar which devours foliage, leaving the trees looking as if a fire had swept over them. The spring cankerworm (q.v.) and the *Rhopobota vacciniana* are examples.

FIRE WORSHIP. Devotion paid to fire as a sacred element, and one of the earliest forms of worship among mankind. This widespread cult, like sun worship, earth and water veneration, may be recognized in many phases from primitive ages to the present day, from savagery to civilization. A distinction between the primitive fetish worship of the physical fire itself and the more advanced conception of a divinity or fire god behind the flaming manifestation is not always easy to draw among the nations that have paid reverence to this element. It is easy, however, to see how fire, as an incarnation of light opposed to darkness, and as a power so beneficent and yet on occasion maleficent, would be a natural object of veneration. Nor is it difficult to understand the devoted care and pious attention early bestowed upon the cherished flame sprung from the spark so hard to obtain and so difficult to maintain. It was this that made the fire, which was preserved for the general good on an altar or in a shrine, the focus of the early community and made the domestic hearth the centre and symbol of the home and family. Special functions or time-honored rites were associated with the production and keeping of the fire, and those who ministered upon it, as its worship developed, came to be holy and powerful priests, as the guardians of a divine gift.

The savage tribes of American Indians, like the rude natives of West Africa, paid homage to a fire spirit as ancestor, and, as Tylor has pointed out, the Polynesians and Mexicans acknowledged in their worship a fire god akin to the divinity of the sun. The worship of Moloch in ancient Canaan was a form of homage to the genius presiding over fire; and hallowed rites to the fire were performed among the Egyptians, Assyrians, Chaldæans, and the less civilized Mongolian tribes.

Nearer to our own race, however, was the veneration shown for fire among the early Indo-Germanic peoples. In India of old, e.g., there was an elaborate fire ritual; sacrifice to the fire was one of the first acts of morning devotion; and the hymns addressed to the fire god Agni (q.v.) in the Rigveda outnumbered those in praise of any other divinity. In Greece and Rome likewise, the fire cult of Hestia or Vesta, and of Hephæstus or Vulcan, was a marked feature in the religion. The Slavic race, including Old Prussians, Lithuanians, and Russians, preserve reminiscences of earlier fire worship. Among the ancient Celts, Brigit was worshiped particularly as the goddess of fire and fertility. But in this respect most important among the members of the Indo-European family are the Persians.

In Iran from the earliest times the care of the fire was so scrupulous and so elaborately developed that it formed the most noticeable characteristic of the ancient Persian faith. The religion of Zoroaster (q.v.) is sometimes, therefore, called fire worship, but erroneously, as the Parsis or modern adherents of the creed insist. It is certain that in the *Avesta* (q.v.) the fire played a most prominent rôle; it was personified as the "Son of Ormazd," and inconceivable pains were taken to preserve the sacred element from defilement. The regular name for a priest in the Zoroastrian scriptures is *āthravan*, 'belonging to the fire'; and Greek writers describe how the fire was carried in state processions before the Persian kings, for it was a symbol of the divine presence and of national feeling. The extinction of the holy flame in the temples, when the Mohammedans conquered Persia, was synonymous with the downfall of Iran. The sacred fire which the Parsis (q.v.) carried with them from Persia to India when they fled as religious exiles was to them an outward sign of their nationality as it was of their faith—a palladium of the worship of Ormazd. As Zoroastrianism apparently sprang up first in the neighborhood of the Caspian Sea with its oil wells and petroleum fountains, one may imagine that this fact may have had some influence on the early Persian faith, and there are Parsis or Ghebers (q.v.) that still do reverence to the eternal flame that leaps from the earth at Baku on the Caspian shore. It is interesting to add that near Rawalpindi in northern India there is a sacred fire cherished by Mohammedans, which is unusual for Islam, and it has been supposed that this may show evidence of influence exerted by early Persian fire worship combined with the old fire cult of India itself. Whatever may have been in olden times the feeling or attitude of the Persians in their worship or veneration of fire, or whatever were the views that made the victorious Mohammedans brand them as idolaters and fire worshipers, the modern Zoroastrians of India reject such a title and emphasize that they look upon fire as a sign or symbol, as a manifestation of the divine power, purity, and essence. It may be added, in conclusion, that *pyrolatry* as a scientific designation is sometimes employed to designate fire worship. Consult: Tylor, *Primitive Culture* (2 vols., New York, 1889); A. Kuhn, "Herabkunft des Feuers," in his *Mythologische Studien* (2d ed., Gütersloh, 1886); Zaborowski-Moindron, "Le feu sacré et le culte du foyer des Slaves contemporains," in *Société d'Anthropologie de Paris Bulletins et Mémoires*, series 5, vol. i, pp. 530–534 (Paris, 1900); MacCulloch, *Religion of the Ancient Celts* (Edinburgh, 1911); Macdonell, *History of Sanskrit Literature* (London, 1913).

FIRE WORSHIPERS. See GHEBERS.

FIRISHTAH, fê-rēsh'tȧ, MUHAMMAD QASIM HINDŪ SHĀH (?1570–?1612). A celebrated Persian historian. He was born at Astrabad on the Caspian Sea. At a very early age he went with his father (Ghulam Ali Hindū Shāh) to India, where we find him, when 12 years old, at Ahmednagar in the Deccan. He afterward became captain in the bodyguard of Murtadah Nizam Shah; and when this King was deposed by his own son, Firishtah went to Bijapur (998 A.H., 1589 A.D.), where Ibrahim 'Adil Shah II, the reigning monarch, received him with great honor. Soon after his arrival Firishtah is mentioned as taking part in an action against Jamal Khan, in which the historian was wounded and taken prisoner; but erelong he made his escape. His death is supposed to have taken place shortly after the year 1612. His great work is the *Tarikh i Firishtah*, a history of the Mohammedan power in India. Written with an impartiality, simplicity, and clearness rare in an Eastern work, this history has become a standard work on the subject, into which it was the first to enter at length. Single portions of it have been translated by Dow, Scott, Stewart, Anderson, etc.; but the whole work was first edited by Briggs (Bombay, 1831), and also translated by him under the title *The History of the Rise of the Mahomedan Power in India* (4 vols., London, 1829; republished ib., 1908–10), which consult for a brief biography.

FIR′KIN (ODan. *firken*, multiple of four, from *fire*, four, OHG. *fior*, *fier*, Ger. *vier*, Goth. *fidwor*, AS. *fēower*, Eng. *four;* connected with Ir. *cethir*, OChurch Slav. *chetyri*, Lith. *keturi*, Lat. *quattuor*, Oscan *petur*, Gk. *τέσσαρες*, *tessares*, Skt. *catur*, four). An old British measure of capacity for liquids, dating from about the fifteenth century, containing nine gallons, or corresponding to one-quarter of the old beer barrel of 36 gallons. It had two values, also being taken at eight gallons in old ale measure. In the United States the term "firkin" is applied to a wooden container or receptacle used for butter or lard, in which the contents are sold usually on the basis of weight. See WEIGHTS AND MEASURES.

FIR′MAMENT (Lat. *firmamentum*, from *firmare*, to strengthen, from *firmus*, firm). A word used to denote the vault of heaven. The term found its way into English from the Vulgate, which renders the Septuagint *στερέωμα*, *stereōma*, and the Hebrew *raqi'a* by the Latin *firmamentum* (Gen. i. 6). *Raqi'a* (from the verb *raqa'*, to extend) signifies whatever is beaten or stretched out, and was especially employed by the Hebrews to denote the hemisphere above the earth, compared (Ex. xxiv. 10) to a splendid and pellucid sapphire. Elsewhere (Ezek. i. 22–26) it is spoken of as the "floor" on which the throne of the Most High is placed. Hence it follows that the notions of solidity and expansion were both contained in the Hebrew conception of the firmament (Job xxxvii. 18). The blue ethereal sky was regarded as a solid sphere, to which the stars were fixed, and which was constantly revolving, carrying them with it. This sphere, or firmament, rested on the loftiest mountains as pillars and divided the waters which were under the firmament from the waters which were above the firmament; and the theory of the phenomena of rain, etc., was that there were "windows in heaven"—i.e., in the firmament—through which, when opened, the waters that were above the firmament descended (Gen. vii. 11; 2 Kings vii. 2, 19; Ps. lxxviii. 23 and cxlviii. 4). Similarly, under the earth there was another sea, called the "deep" or "great deep." The view entertained by the Greeks and other early nations was essentially the same. In the progress of astronomical observations it was found that many of the heavenly bodies had independent motions inconsistent with the notion of their being fixed to one sphere or firmament. Then the number of crystalline spheres was indefinitely increased, each body that was clearly independent of the rest having one assigned to it, till a complex system was introduced capable of being fully understood only by the philosophers who devised it. See PTOLEMAIC SYSTEM.

FIRMAN, fĕr′man *or* fĕr-män′ (Turk. *fermān*, Pers. *farmān*, Skt. *pramāṇa*, authority, norm, from *pra*, forth + *mā*, to measure). A word used by the Turks to denote any official decree emanating from the Ottoman Porte, usually for the purpose of providing protection and assistance for a traveler, or to sanction an enterprise and prescribe its conditions. Its employment in Persia is as old as the time of Darius, who in the Old Persian inscription speaks of his commands or statutes as *framāna*. The right of signing any firman relating to affairs connected with his special department is exercised by every minister and member of the Divan, but the office of placing at the head of the firman the *thograi*—a cipher containing the name of the Sultan in interlaced letters, which alone gives effect to the decree—is committed to the hands of a special minister, who is called *nichanji effendi*. The name applied to such decrees as have been signed by the Sultan himself is *hatti-sherif* (q.v.). The name "firman" may also signify a more formal kind of Turkish passport, which can be granted only by the Sultan or by a pasha. A written permission to trade is also called in India a firman.

FIRMENICH-RICHARTZ, fĕr′me-nĭk rĭk′ärts, JOHANNES MATTHIAS (1808–89). A German author and Germanic scholar, born in Cologne and educated at Bonn and Munich. He was also known as a playwright and poet. In 1860 he was appointed professor in Berlin, where he published his principal work, *Germaniens Völkerstimmen. Sammlung der deutschen Mundarten in Dichtungen, Sagen, Märchen, Volksliedern, etc.* (3 vols., 1843–66; supplementary volume, 1867).

FIRMIAN, fĕr′mē-än, KARL JOSEPH, COUNT (1716–82). An Austrian statesman, born at Deutschmetz, Tirol, and educated at Erthal, Innsbruck, Salzburg, and at the University of Leyden. He was sent by Maria Theresa as Ambassador to Naples in 1753 and as Governor-General to Lombardy in 1756. He was a patron of Winckelmann, of Angelica Kauffmann, and of many other scholars and artists. Many libraries were established by him, while his own collection (the "Bibliotheca Fermiana") of 40,000 volumes (catalogue in 10 vols., 1783) was always accessible to investigators and was later in part incorporated with the Brera Library in Milan.

FIR′MICUS MATER′NUS, JULIUS. A Latin author of the fourth century, a native of Sicily, who about 336 A.D. wrote eight books on astrology (*Matheseos Libri VIII*), in which he formulated a complete theory of astronomical superstition in the spirit of the Neoplatonists; the work shows some acquaintance with Christianity. The work was first published in the *Astronomici Veteres* (1499) and subsequently by Pruckner (1533 and 1551). Other editions are by Sittl (1894), and, finally, by Kroll, Skutsch, and Ziegler (2 vols., 1897, 1913). Later, about 347 A.D., he addressed to the sons of Constantine the Great a work entitled *De Errore Profanarum Religionum*, treating of the false fanaticism of paganism and counseling its complete annihilation. This work was edited by Halm, in vol. ii of the *Corpus Scriptorum Ecclesiasticorum Latinorum* (Vienna, 1867), and by

Ziegler (Kempten, 1913). Consult Teuffel, *Geschichte der römischen Litteratur*, §§ 406–407 (6th ed., Leipzig, 1911), and Jordan, *Geschichte der altchristlichen Litteratur* (ib., 1911).

FIRMIL'IAN. A dramatic poem by W. E. Aytoun (1854).

FIR'MIN, Thomas (1632–97). An English philanthropist, born at Ipswich. In 1662 he raised money for the Polish exiles of the Unitarian belief and in 1681 for the Polish Calvinists when they shared the same fate. But he was better known for his charities at home, and especially for the employment he provided (1665) in London to help needy workmen after the plague, and again in 1666 after the great fire. From 1676 he devoted himself entirely to philanthropic schemes of various kinds. He built a linen factory, where a little later he employed 1700 workmen, and in 1682 he established a second factory at Ipswich to help the refugees from France, besides making large collections for them. From 1673 to his death he was a governor of Christ's Hospital, save for a break caused by his opposition to James II. In politics he seems to have been Republican, but was an ardent admirer of William III; and in theology he was an anti-Trinitarian, though he never left the English church. He wrote *Some Proposals for the Imploying of the Poor, especially in and about London, and for the Prevention of Begging* (1678; reprinted in 1681, and in 1787 in *Tracts Relating to the Poor*).

FIRMINY, fēr'mē'nē'. A town in the Department of Loire, France, 45 miles by rail from Lyons (Map: France, S., J 3). It is situated in a coal-mining region and manufactures steel and iron, also woolen goods and ribbons. Pop. (commune), 1901, 16,903; 1911, 19,580.

FIRMISTERNIA, fẽr'mĭ-stẽr'nĭ-à. A division of the tailless Amphibia (Anura), which includes those tongue-possessing frogs (the families Ranidæ and Engystomatidæ), in which the two halves of the shoulder girdle meet in the middle line and form a firm median bar. (This is contrary to the case in the correlative division Arcifera, in which the two halves of the shoulder girdle overlap on the ventral side and are to some extent movable upon each other, allowing the thorax to expand and contract.) The firmisternal type "is morphologically the higher and more recent and passes in the larval stage through the arciferous condition." It is characteristic also of the Aglossa (q.v.). Cope and Boulenger regard the Firmisternia and Arcifera as a suborder, equivalent to the Aglossa and others; but the latest revision of the classification of the Anura (Gadow, 1901) makes Firmisternia and Arcifera divisions of the suborder Phaneroglossa, or tongue-bearing frogs and toads. The Phaneroglossa and the Aglossa constitute the Anura. Consult Gadow, *Amphibia and Reptiles* (London, 1901).

FIROZPUR. See Ferozepore.

FIRST AID TO THE INJURED. See Antidote; Asphyxia; Bleeding; Resuscitation; Respiration, Artificial.

FIRST-BORN (translation of Heb. *bekor*, from *bakar*, to break forth). In biblical usage, a term which signifies the first male offspring, whether of man or of other animals. The first-born male was devoted from the time of birth to God. In the case of first-born male children the law required that within one month after birth they should be redeemed by an offering equivalent in value to five shekels of silver (Ex. xiii. 13; Num. xviii. 15–16). If the child died before the expiration of 30 days, the obligation of redemption ceased; but if that term were completed, the obligation was not extinguished by the subsequent death of the infant. This redemption took place according to a fixed ceremonial. It is difficult to say in how far these laws of redemption point to the existence in earlier days of the actual offering of the first male child to a deity. Traces of such offerings are found, but the instances appear to be exceptional—as in moments of great danger (2 Kings iii, 27; cf. also 2 Kings xxi. 6). On the other hand, the narrative of Abraham's readiness to sacrifice Isaac would lose part of its meaning if the rite was really resorted to only under exceptional circumstances. The rite of circumcision has also been considered by some scholars as a modification of an original offering of the first-born; but it is also likely that the symbol replacing the reality was introduced at a comparatively early age.

The first-born male of animals also, whether clean or unclean, was equally regarded as devoted to God. The first-born of clean animals, if free from blemish, was to be delivered to the priests within 12 months after birth to be sacrificed to the Lord (Deut. xv. 19–21); nor was it permitted to any but the priests to partake of the flesh of such victims (Num. xviii. 15–19). If the animal was blemished, it was not to be sacrificed, but to be eaten at home (Deut. xv. 22). The first-born of unclean animals, not being a fit subject for sacrifice, was either to be put to death or to be redeemed with the addition of one-fifth of its value (Lev. xxvii. 27; Num. xviii. 15). If not redeemed, it was to be sold, and the price given to the priests.

Primogeniture, both by the patriarchal custom and by the Pentateuchal codes, had certain privileges attached to it, the chief of which were the headship of the family and a double portion of the inheritance (cf. Deut. xxi. 16, 17). "First-born" was a title of honor or affection (Ex. iv. 22; Jer. xxxi. 9). The Hebrews shared with the other Semites a belief in the sanctity of first fruits in general which may properly be traced back to a natural feeling of rejoicing and gratitude. Hence, even among Semites in a nomadic state, special privileges are accorded to the first-born, and to barter away one's birthright was regarded as a disgrace. In this respect the story of Esau's selling his birthright for a mere mess of pottage—an act which the writer holds up to scorn (Gen. xxv. 29–34)—well reflects the general view. As a people advances from the nomadic to the pastoral and thence to the agricultural stage, the views connected with the first-born are naturally extended to animals and to produce of the fields. Hence, in the Pentateuchal codes, which are based on the agricultural stage, ample provisions are made for rites connected with the various classes of "first" productions. See First Fruits; Family; Succession; Primogeniture.

FIRST FRUITS (translation of Heb. *reshith*, or *bikkurim*, first, best). That portion of the fruits of the earth, and other natural produce, which, by the usage of the Hebrews and other ancient nations, was offered to the Deity, as an acknowledgment of His supreme dominion and a recognition of His bounty. (Consult Frazer, *Golden Bough*, vol. ii, London, 1890.) Among the Hebrews the institution of first fruits comprised both public and private offerings. The regulations are set forth in the several codes of the Pentateuch. Taking these codes together, the regulations may be summarized as follows:

Of the public class there were three principal offerings. The first was at the opening of the corn harvest. On the day after the first day of the Passover, the 16th of the month Nisan, a sheaf of new corn, which was cut and gathered with much solemnity, was carried to the holy place and there waved before the altar (Lev. xxiii. 40 et seq.); nor was it permitted to commence the harvest work till after this solemn acknowledgment of the gift of fruitfulness. Again, at the Feast of Pentecost, seven weeks later, two loaves of leavened bread, made from the flour of the new harvest, were waved, with a similar form of worship, before the altar (Ex. xxxiv. 22; Lev. xxiii. 15–17). Thirdly, at the Feast of Tabernacles, in the seventh month, was held the great feast of the completed harvest, the final acknowledgment of the bounty of God in the fruits of the year (Ex. xxiii. 16; Lev. xxiii. 33–34).

Besides these public offerings of first fruits on the part of the entire people, individual Hebrews were bound to private offerings, each upon his own behalf. A cake of the first dough, one-twenty-fourth of the amount, was to be offered to the Lord (Num. xv. 21). The "first of all the fruits" were to be placed in a basket and carried to the appointed place, where the basket was to be offered with a prescribed formula, commemorative of the sojourn of Israel in Egypt and of his deliverance by the strong hand (Deut. xxvi. 2 et seq.). Fruit trees were given three years for growing, then the fruit of the fourth year was to be given to God (Lev. xix. 23–25). All these offerings were divided into two classes. The first, which were called *bikkurim*, comprised the various kinds of raw produce, of which, although the law seems to contemplate all fruits, seven sorts only were considered by the rabbis to fall under the obligation of first-fruit offering, viz., wheat, barley, grapes, figs, pomegranates, olives, and dates. He who lived near Jerusalem brought fresh fruits; others could bring them dried. It was customary for offerers to make their oblations in companies of 24 and with a singularly striking and effective ceremonial. The second class, the *reshith*, were brought of prepared materials, dough, wine, oil, etc. The *terumoth* were taxes consisting in the first ripe of the fruit, whether of the ground or of trees, levied for the support of the priests. There was no definite amount. Between one-fortieth and one-sixtieth of the harvest could be given, but it does not appear that this regulation was ever strictly carried out except by a small minority of pious devotees, just as various other provisions remained a dead letter. With the destruction of the second temple all offerings and sacrifices were abolished, though among orthodox Jews, as a reminiscence of the temple cult, a portion of the dough for baking bread is still thrown into the fire.

Offerings analogous to the Jewish first fruits became usual very early in the Christian Church, as is clear from passages in Irenæus (*Adv. Hær.* iv, 17 and 34); but the extent to which they prevailed, and the amount and general character of the oblation, are exceedingly uncertain. It appears to have been merged in the legal provision established by the emperors.

The mediæval ecclesiastical impost known under the name of *primitiæ*, or first fruits, and sometimes of *annates* or *annalia*, was entirely different. By the word, in its mediæval and modern sense, is meant a tax imposed by the popes on persons presented directly by the Pope to those benefices which by the canonical rules, or in virtue of privileges claimed by them, fall within the papal patronage. Persons so presented were required to contribute to the Roman see the first fruits (i.e., the income of the first year) of their benefice. During the residence of the popes at Avignon, when the papal necessities compelled the use of every means for eking out a precarious revenue, it was sought to extend the impost to every benefice; and this claim was the subject of many contests, especially in Germany and in England, where the claim, so far as regarded direct papal presentation, had existed from the reign of King John. Henry VIII withdrew the right of the first fruits from the Pope in order to transfer it to the King; and he established a special court for the administration of first fruits, which, however, was soon abandoned. In the reign of Anne the revenues arising from this impost in England were vested in a board, to be applied for the purpose of supplementing the incomes of small benefices. In France this tax was abolished by the "pragmatic sanction" enacted at Bourges in 1438 and subsequently by the concordat of Leo X with Francis I in 1516. In Spain it ceased partially in the reign of Ferdinand and Isabella and finally under Charles V. In Germany it formed one of the first among the *centum gravamina* presented to the Emperor in 1521, and the claim ceased altogether from that period. Consult the Hebrew Archæologies of Nowack (Freiburg, 1894) and Benzinger (2d ed., Tübingen, 1907), and Robertson Smith, *Religion of the Semites* (London, 1894). See FIRST-BORN.

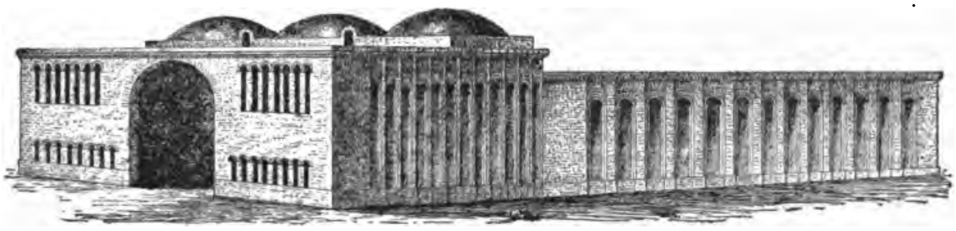
FIRST GENTLEMAN OF EUROPE. A title given to the Prince Regent, afterward King George IV of England.

FIRST GRENADIER OF FRANCE. A title given to Latour d'Auvergne (q.v.).

FIRST LIEUTENANT OF A MAN-OF-WAR. See LIEUTENANT, FIRST, under head of LIEUTENANT.

FIRTH, or **FRITH** (from Icel. *fjörþr*, ford; connected with Lat. *portus*, port, Skt. *par*, to cross). A name used in Scotland for deep inlets of the sea, in many cases of estuarine formation. The term "firth" is similar to the Norwegian "fiord," an inlet with high rocky walls; the Scottish firths often have the characteristics of fiords. See ESTUARY; FIORD.

FIRTH, CHARLES HARDING (1857–). An English historian, born in Sheffield. He studied at Clifton College and at Balliol College, Oxford, where he became a scholar in 1876 and an instructor in 1883. From 1887 to 1893 he was a lecturer at Pembroke College, Oxford; in 1900 he became Ford's lecturer in English history in the University of Oxford, in 1901 fellow of All Souls' and in 1904 of Oriel, and in the last-named year he was made regius professor of modern history. His special field was the Civil War and the Protectorate, and, besides contributions on this period to the *Dictionary of National Biography*, he wrote: *Oliver Cromwell and the Rule of the Puritans* (1900); *Cromwell's Army* (1902); *The Last Years of the Protectorate* (1909); *The House of Lords during the Civil War* (1910). He edited a number of historical and biographical works, among which are: *Memoirs of Edward Ludlow* (1892); *Memoir of the Life of Colonel Hutchinson* (1896); *Scotland and the Commonwealth; Letters and Papers Relating to the Military Government of Scotland, 1651–53* (1895); and its sequel, *Scotland and the Protectorate, 1654–59* (1899). He edited (1914–) an illustrated edition of Macaulay's *History of England.*



PALACE OF FIRUZABAD.

FIRTH, Mark (1819–80). An English steel manufacturer and philanthropist, born at Sheffield. He left school at the age of 14 to enter the steelworks where his father was employed. In 1843 he and his father established a small foundry, which soon became very extensive and acquired a considerable trade in America. They built huge works at Sheffield in 1849. The firm manufactured steel blocks for ordnance, spherical and elongated shot, and every variety of heavy forgings for engineering requirements. The manufacturing and refining of steel from Swedish iron was successfully carried on, and nearly all the steel used in making English guns was produced by this firm. Firth was also celebrated as a public benefactor. His numerous gifts and endowments include the Mark Firth's Almshouses at Ranmoor, erected at a cost of £30,000, and consisting of 36 houses, left as a permanent legacy to the poor of Sheffield; a freehold park of 36 acres for a recreation ground (opened by the Prince and Princess of Wales, Aug. 16, 1875), and the Firth College, erected at a cost of £20,000 and furnished with an annual endowment of £5000 (opened by Prince Leopold, Oct. 20, 1879).

FIRTH OF FORTH. See Forth.

FIRUZ I, fē′rōōz. One of the Arsacide kings of Persia, who reigned 78–103. He is also called Arsaces XXIV, King of Parthia, and is identified with Pacorus II of the classical writers.

FIRUZ II (457–484), or Pērōz. A king of Persia, of the Sassanide dynasty, son of Yazdegerd II. He overthrew and put to death his younger brother, Ormazd (or Homizd) III, and so came to the throne. The reign of Firuz was unhappy, though he succeeded in being at peace with the Romans. The Ephtalites, or White Huns (so called to distinguish them from the true Huns), threatened the kingdom. The Persians undertook two expeditions against them, but were unsuccessful in both, and in the second one Firuz and 29 of his sons perished.

FIRUZ III (?–679). The last of the Sassanides of Persia. He was expelled from Persia by the new Mohammedan power on the defeat of his father, Yazdegerd III, in the battle of Nehavend, about 641, and took refuge with the Emperor of China, Kao-Tsung, who vainly endeavored to restore him to the Persian throne.

FIRUZABAD, fē-rōō′zȧ-bȧd. A Sassanian palace, 65 miles from Shiraz, built by Firuz II (fifth century). The length was about 342 feet and the breadth 178. The plan of the building was rectangular, the entrance being on the north side, where there was a great porch. Within there were reception rooms; behind these, three square rooms, side by side, each having a vaulted dome, and behind these an open court surrounded by vaulted chambers. The massive walls were constructed of rough stone, the vaulting was of brick, and plaster was used to finish off the surfaces. The general style of architecture shows traces of Mesopotamian, Byzantine, and Roman influences, the particular features being copies of decorations in Persian palaces, the use of blind arches, and a zigzag molding of projecting bricks.

FIRUZABADI, fē′rōō-zȧ-bä′dē, Medjed ed-Din (1329–1414). A Mohammedan lexicographer, born at Karazin, near Shiraz. Several educational institutions at Medina and Mecca were founded by him. Three years after his meeting with Timur at Shiraz (1382) he was appointed chief cadi of Yemen, which position he retained until his death. He achieved celebrity through his great lexicographical work *Qamus* ("The Ocean"; best ed. by Nasr al-Hurini, 4 vols., 1301–02 of the Hegira). The work has also been translated into Turkish (3 vols., 1230–40 A.H.) and Persian (Calcutta, 1840 A.D.).

FIRUZ SHAH I, Rukn ud-Din. A Mohammedan king of Delhi. He succeeded his father, Shams ud-Din Altamsh, in 1236 A.D., after having been governor of Lahore. He was deposed after a reign of seven months and was succeeded by his sister, the Sultana Razziya, or Raziyat-ud-Din ('Devoted to the Faith'). Consult Lane-Poole, *Mediæval India under Mohammedan Rule* (New York, 1903).

FIRUZ SHAH II, Jalal ad-Din (?–1296). The founder of the Khalji dynasty of the Mohammedan sultans of Delhi, a magnanimous ruler, who succeeded to the throne in 1290 at the age of 70. His rare clemency and humility were exasperating to his followers, who desired a fighter and not a lover of art and learning as he proved to be. He freely forgave Chhaju, a nephew of Balban, and his rebel followers, after they had attempted to overthrow him, and even went so far as to refuse to execute the members of a society of assassins, whom he merely banished to Bengal. That he was brave in battle is obvious from his campaign against the Mongols on the Indus in 1292. In 1296 he was drawn unarmed into a trap and basely assassinated by his nephew, Ala-ad-Din, who two months later succeeded to the throne. Consult Lane-Poole, *Mediæval India under Mohammedan Rule* (London, 1903).

FIRUZ SHAH III (1296–1388). King of Delhi. He succeeded Mohammad II ibn Taghlak III in 1351. A most merciful and pious ruler, his reign was tranquil and his country prosperous. In 1386 he abdicated, and two years later he died.

FISC (Fr. *fisc*, from Lat. *fiscus*, treasure chest). The public treasury. The Latin term was originally applied to the private purse of the Emperor, to distinguish it from the public treasury, or *ærarium*. Later it came to designate the Imperial treasury, in contradistinction to the private property of the ruler, in which sense it is employed in modern countries whose jurisprudence is derived from the civil law. The fisc has, in Roman fashion, been personified and is in law considered as an ideal or juristic person. It has a legal right to all the state revenues, including those derivable from forfeitures. In suits against it by a subject, all questions of doubt are to be resolved in favor of the subject. Consult: Bracton, *De Legibus et Consuetudinibus Angliæ* (Twiss ed., London, 1878–83); Spelman, *Glossarium Archaiologicum* (ib., 1867); *Molina* v. *United States* (6 *Court of Claims Reports*, 209, 1870); Sohm, *Institutes of Roman Law* (2d ed., Oxford, 1901).

FISCANNUM. See FÉCAMP.

FISCHART, fish'ärt, JOHANNES (c.1545–c.91). The great German satirist of his century, also a Protestant reformer. A doctor of the University of Basel (1574), his literary activity was confined chiefly to the years 1575–81, after which he became absorbed in his duties as advocate at the Imperial court at Speyer, and as local magistrate (1583) at Forbach, where he died. Some 50 of the satires attributed to him are authentic. They are directed against the Pope, the Jesuits, vicious priests, the aristocracy, pedants, astrologers, and folly of every kind. His most famous works are the Rabelaisian *Aller Praktik Grossmutter* (1572); *Eulenspiegel Reimensweiss* (1571); *Affenteurliche und ungeheuerliche Geschichtschrift . . . von Gargantua und Pantagruel* (1575); the coarsely comic parody of the animal epic, *Flöhhatz, Weibertratz* (1574); the anticlerical *Bienenkorb des heiligen römischen Imenschwarms* (1579, suggested by the *Bynencorf* of the Dutch Marnix); *Der heilige Brotkorb* (1580), an imitation of Calvin's *Traité des reliques; Das vierhörnige Jesuiterhütlein* (1580); the genially comic *Das glückhafft Schiff von Zurich* (1576; ed. by Baechtold, 1880). His poems were edited by Kurtz (Leipzig, 1866–68). Consult studies of Fischart by Wackernagel (Basel, 1875), Wendeler (Halle, 1879), and Besson (Paris, 1889).

FISCHBACH, fish'bäc, FRIEDRICH (1839–1908). A German textile designer, born at Aix-la-Chapelle. He was educated at the Academy of Industrial Design in Berlin and in 1862 went to Vienna, where he worked as decorator and designer. In 1870 he was appointed teacher of ornamentation at the Royal Academy in Hanau. He was director of the newly organized Industrial Art School at Saint-Gall from 1883 to 1888, and in 1889 settled in Wiesbaden, Germany. Several societies for the advancement of industrial art were established by him, and he was influential in the development of textile design in Germany. His collection of antique fabrics and embroideries was acquired by the Metropolitan Museum, New York, in 1909. His principal literary works include: *Ornamente der Gewebe* (with 160 colored plates, 1874–81); *Geschichte der Textilkunst* (1883); *Südslavische Ornamente* (2d ed., 1872); *Album für Stickerei* (130 patterns, printed in gold and colors; later eds., 1872 and 1880); *Neue Muster für Stickerei und Häkelarbeiten* (3 series, 1880–83); *Stickereimuster* (4 parts, 1888); *Häkelvorlagen* (1889); *Weissstickereivorlagen* (1892); *Die wichtigsten Webemuster bis zum 19ten Jahrhundert* (1900).

FISCHER, fish'ẽr, ABRAHAM (1850–1913). A South African public official, born at Green Point, Cape Town, and educated at the South African College. Participating in the politics of Orange Free State, he became a member of its Volksraad in 1878 and of its Executive Council in 1896, and also served in various colonial and interstate conferences. During the South African War he was president of the joint deputation of the Transvaal and Orange Free State to Europe and America. He served as chairman of the Orangia Unie; held the premiership of the Orange River Colony from 1907 to 1910; and after the Union of South Africa was formed he became Minister of Lands in 1910, Privy Councilor in 1911, and Minister of the Interior and Lands in 1912.

FISCHER, fish'ẽr, BERNHARD (1852–). A German bacteriologist, born in Coburg and educated at Berlin. He became M.D. in 1875, accompanied the German Cholera Commission to Egypt and India, in 1889 was a member of the German Plankton Expedition, and in 1887 became docent and in 1899 professor in the University of Kiel, where he was also director of the Institute of Hygiene. He made important bacteriological studies of sea water and sea air; also an original and valuable classification of bacteria, based on morphological characters, particularly number and distribution of cilia; and his *Structure and Functions of Bacteria* (2d ed., 1900) is a standard work.

FISCHER, EMIL (1838–1914). A famous German dramatic basso, born in Brunswick. He made his début in 1857 in Graz in Boieldieu's *Jean de Paris*. After that he filled various engagements in Pressburg, Stettin, and Brunswick. From 1863–70 he was director of the opera at Danzig. From 1875–80 he sang in Rotterdam, and from 1880–85 in Dresden. The period from 1885 to 1891 at the Metropolitan Opera House, New York, marks the culmination of his artistic triumphs. Here he not only created the bass rôles in Wagner's later music dramas, as far as America is concerned, but also firmly established his reputation as a Wagner interpreter surpassed by none and equaled by very few. Especially his Hans Sachs is still regarded as an ideal not reached by any other artist. From 1895 to 1897 he was a member of Mr. Damrosch's German company, and he appeared once more, and for the last time, at the Metropolitan Opera House in 1904. He died in Hamburg.

FISCHER, EMIL (1852–1919). A celebrated German chemist, born at Euskirchen. He studied at Strassburg and in 1879 was made professor extraordinary at the University of Munich. Three years later he was appointed full professor of chemistry at Erlangen and in 1885 was invited to take a similar position at Würzburg. When, on the death of the celebrated A. W. Hofmann, the chair of organic chemistry at the University of Berlin became vacant, Fischer was appointed to fill the vacancy (1892). His most important achievement was the synthetic production of the simple sugars and the complete demonstration of their chemical constitution.

Although he did not succeed in synthesizing ordinary cane sugar and the more complex carbohydrates (such as cellulose and starch), his researches have thrown much light on their chemical constitution and have thus paved the way for future success. Of very great importance, further, were his researches on the constitution of substances of the "purine group" (including the well-known alkaloids caffeine and theobromine), the polypeptides (artificial proteid-like substances), and the depsides (tannin-like substances). His epoch-making researches, which have created several new chapters in the science of organic chemistry, were crowned with the Nobel prize in 1902. His *Anleitung zur Darstellung organischer Präparate* (5th ed., 1896; Eng. trans. by Stanford, 1909) is well known to every student of organic chemistry. His papers have also been published in collected form. His publications include further *Die Chemie der Kohlenhydrate und ihre Bedeutung für die Physiologie* (1894) and *Chemical Research in its Bearings on National Welfare* (1912). See Carbohydrates; Polypeptides; Stereochemistry.

FISCHER, Gustav Adolf (1848–86). A German explorer, born at Barmen. In 1876 he accompanied the Denhardt East African exploring expedition to Zanzibar, where he settled as a physician, and in the following year explored Wito and the southern Galla country. In 1878 he continued his journey to Wapokomoland and along the Tana River to Massa. With the support of the Geographical Society of Hamburg he visited the Massai country in 1882 and penetrated from the mouth of the Pagani to Lake Naivasha. The hostile attitude of the natives prevented him from advancing farther. Equipped with funds by the brother of Junker, an explorer, who with Emin Pasha and Casati had been lost in the equatorial provinces, he organized a relief expedition, which, however, was compelled to return after reaching Lake Victoria Nyanza. Shortly after his arrival in Germany in 1886, he died of a bilious fever contracted during this journey. He wrote: *Mehr Licht im dunkeln Weltteil* (1885), *Das Masai-Land* (1885), as well as articles in *Zeitschrift für Ethnologie* and in the *Verhandlungen* of the Hamburg Geographical Society.

FISCHER, Jean Chrétien (c.1716–62). A German soldier in the French service, born in Stuttgart and educated at Giessen. He entered the French army about 1737 and fought in the War of the Austrian Succession. In 1743 he was authorized by the Marshal de Belle-Isle to raise a company, which was called Fischer's *chasseurs*, the origin of that branch in the French army. He was a prisoner from 1746 to 1748. He served in India and distinguished himself in the Seven Years' War, was made brigadier for his bravery at Arloff (1759), added to his fame at Clostercamp (1760), resigned his command to the Marquis de Conflans (1760), but still fought in his old troop with the rank of a lieutenant colonel. He was killed in a duel with a French officer who challenged him after the French defeat at Wilhelmsthal (June 24, 1762).

FISCHER, Johann Georg (1816–97). A German poet, born at Gross-Süssen, Württemberg. He taught at Langenau, Ulm, and Stuttgart, and in 1860 was appointed professor at the scientific high school in the latter city. As a poet, Fischer may be regarded as the last noteworthy representative of the traditional Suabian school. He was not in sympathy with modern naturalism and was influenced by Schiller, Goethe, Hölderlin, and especially Mörike. He was in the fullest sense a poet of Nature, whose every mood he portrays in his verses. Scarcely less meritorious are his love poems, of which he composed a great number, and which also are animated by an enthusiastic personification and idealization of Nature. Fischer has been called by his admirers "Der schwäbische Frauenlob." Among his principal productions are the following: *Gedichte* (3d ed., 1883); *Aus frischer Luft* (2d ed., 1873); *Neue Gedichte* (1891); *Saul*, a drama (1862); *Friedrich der Zweite von Hohenstaufen*, a drama (1863); *Florian Geyer, der Volksheld im deutschen Bauernkrieg* (1866); *Kaiser Maximilian von Mexiko*, a drama (1868).

FISCHER, Josef (1858–). A German historian and geographer, born in Quadrath, near Cologne. He studied at Münster, Munich, Vienna, and Innsbruck; in 1881 became a Jesuit; then studied at Ditton, in England, and, taking up history and geography, in Vienna and Innsbruck; and in 1895 began teaching geography at the Jesuit "Stella Matutina" in Feldkirch. In 1893–98 he wrote several volumes on Austrian history, but his more important, later work was on the early cartography and exploration of America. The titles of his principal works are: *Die Entdeckungen der Normannen in Amerika* (1902; Eng. trans. by Soulsby, *Discoveries of the Norsemen in America*, 1903); *Die älteste Karte mit dem Namen Amerika* (1903); Waldseemüller's *Cosmographie Introductio* (1907, with Von Wieser), including an English version of Vespucci's *Voyages; Die Weltkarte des Jodocus Hondius* (1907, with Luther Stevenson); *Der deutsche Ptolemäus* (1910); *Claud Clavus, the First Cartographer of America* (1911); *Die handschriftliche Ueberlieferung der Ptolemäuskarten* (1912); *An Important Ptolemy Manuscript* (1913).

FISCHER, Kuno (1824–1907). A noted German philosopher and literary critic. He was born at Sandewalde, Silesia, studied at the universities of Leipzig and Halle, in 1850 became an instructor in philosophy at Heidelberg, and when his lectureship had been withdrawn in 1853 by direction of the Baden ministry, continued researches at Heidelberg and was in 1856 appointed a lecturer at Berlin. He had, however, a short time previously accepted an honorary professorship at Jena and continued to occupy it until 1872, when he was called to the chair of philosophy (to succeed Zeller) and modern German literature at Heidelberg. He achieved high distinction as academic lecturer, orator, and author. His philosophical viewpoint is, with some modifications, Hegelian. His chief work is the *Geschichte der neuern Philosophie* (jubilee edition in 10 vols., 1897–1903), at once the most extensive and the most distinguished exposition of the subject. In 1860 his *Kants Leben und die Grundlagen seiner Lehre* lent the first real impulse to the so-called "return to Kant." His controversy with Trendelenburg is noteworthy. Important among his further publications are: *Schiller-Schriften* (2d ed., 1891–92); *Lessings Nathan der Weise* (1896); *Baruch Spinozas Leben und Charakter* (1865); *Goethe-Schriften* (8 vols., 1895–1900); *Shakespeare's Hamlet* (1896); and several "Festreden," such as *Goethe in Heidelberg* (1899).

FISCHER, Ludwig Hans (1848–). An

Austrian landscape painter and etcher, born at Salzburg. A pupil, at the Vienna Academy, of Lichtenfels in painting, of Jacoby in engraving, and of Unger in etching, he completed his studies by travels in Italy, Spain, north Africa, Egypt, and India, and afterward settled in Vienna. Three of his oil paintings, including a "View of Jerusalem," are in the Vienna Museum, and nine decorative landscapes are in the Museum of Natural History there. Among a series of etchings and engravings the cycle "Historical Landscapes from Austria-Hungary" is his most remarkable production. He also painted many excellent water colors and published *Die Technik der Aquarellmalerei* (8th ed., 1901), and wrote numerous magazine articles accompanied by clearly defined and spirited drawings.

FISCHER, fē'shā', Paul Henri (1835–93). A French paleontologist and naturalist, born in Paris. Having obtained his doctorate in sciences and in medicine, he was appointed assistant in paleontology at the Museum of Natural History. In 1872 he became assistant naturalist at the same institution. He was at different times president of the Société Géologique de France and the Société Zoologique de France and in 1880 was a member of the commission for submarine dredging. From 1856 he edited, with Bernardi, the *Journal de conchyliologie.* His publications include: *Faune conchyliologique marine de la Gironde et du sud-ouest de la France* (1865; enlarged by a *Supplément* in 1875); *Recherches sur les Actinies des côtes océaniques de France* (1876); a *Manuel de conchyliologie* (1885); *Paléontologie de l'île de Rhodes* (1887).

FISCHER, fish'ĕr, Theobald (1846–1910). A German geographer, born Oct. 31, 1846, at Kirchsteitz, near Leitz, in Thuringia, and educated at Heidelberg, Halle, Bonn, and Vienna. In 1871 he went to Brussels as a private tutor and eventually to Paris. He was professor of geography at Kiel from 1879 to 1883, when he took the same chair at Marburg, holding it until his death. He was a specialist on Mediterranean geography. In 1886 he visited the Tunisian Sahara and in 1888 made a tour through Morocco and Algeria. In addition to numerous contributions to scientific periodicals his publications include: *Raccolta dei mappemondi e carte nautiche del XIII al XVI secolo* (10 atlases, containing 79 leaves, 1881); *Beiträge zur Geschichte der Erdkunde und der Kartographie in Italien im Mittelalter* (1886); "Die südeuropäischen Halbinseln," in Kirchhoff's *Allgemeine Länderkunde*, is considered his masterpiece. The section dealing with Italy was translated under the title of *La Penisola Italiana.*

FISCHER VON ERLACH, fish'ĕr fōn ĕr'läG, Johann Bernhard (1650–1723). An Austrian architect, born in Vienna. Returning to Vienna after a period of study in Rome, he was employed on the most important buildings of the late seventeenth and early eighteenth centuries in that city. Among the most notable of his works, all of which were designed in the extremest phase of the Baroque (q.v.) style, were the palace of Schönbrunn, the Hofbibliothek (Royal Library), the palace of Prince Eugène, and the church of San Carlo Borromeo; besides works in Breslau and Prague. His son, Joseph Emanuel, completed the library and church above mentioned after his death.

FISCHER VON WALDHEIM, vält'hīm, Gotthelf (1771–1853). A Russian physician and naturalist, born at Waldheim, Saxony. After holding a professorship at Mainz, he accepted a call to Moscow (1803), where he became professor of natural history and director of the university museum devoted to that branch of science. In 1808 he founded the Society of Naturalists at Moscow. He published numerous works on comparative anatomy, on the nutrition of plants, and on galvanism. One of the most important of these is the *Bibliographia Palæontologica Animalium Systematica* (2d ed., 1834).

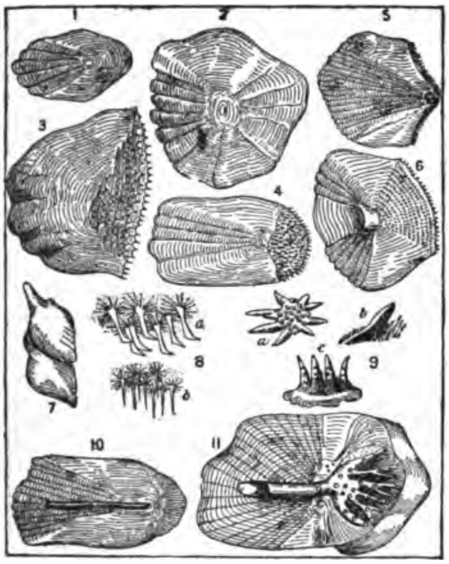
FISCUS. See Ærarium.

FISET, fē'zā', Louis Joseph Cyprien (1825–). A Canadian poet. He was born in Quebec, was educated privately and at Quebec Seminary, and was called to the bar in 1848. He was soon afterward appointed a prothonotary of the Superior Court of the Province of Quebec, an office which he held for many years. In 1860, when the Prince of Wales (afterward Edward VII) arrived at Quebec, the ode of welcome to him was written by Fiset. In 1867 his poem on the discovery of America won a prize in a poetical competition at Laval University. He was a frequent contributor to *La Ruche Littéraire* (Montreal), to *Les Soirées Canada*, and to *La littéraire Canadienne* (Quebec). He was one of the founders of L'Institut Canadien (Quebec), and afterward became its president. He retired on a pension in 1898. He published *Jude et Grazia, ou les malheurs de l'émigration canadienne* (1861).

FISET, Marie Joseph Eugene (1874–). A Canadian soldier. He was born at Rimouski, Province of Quebec, and was educated at Rimouski College and at Laval University, where he graduated in medicine in 1896. He had entered the volunteer militia service as a lieutenant in 1890, was promoted major in 1898, and was brevetted lieutenant colonel in 1901 for his services in the South African War; in 1900 he had been at Paardeberg, Poplar Grove, Driefontein, Hout Nek, and Zand River; also in Orange River Colony and eastern and western Transvaal. In 1903 he was promoted lieutenant colonel, army medical service, and also staff adjutant of medical services; in 1903–06 he was director of general medical services; and he was then appointed Deputy Minister of Militia and Defense. He received the Queen's medal with four clasps, and the decoration of the Distinguished Service Order.

FISH (AS. *fisc*, Ger. *Fisch;* connected with Lat. *piscis*, OIr. *iasc*, fish). A backboned animal which lives in water, breathes by means of gills, and possesses paired fins. Such animals constitute the class Pisces, but popularly the term "fish" includes, in addition to the above, certain other lower vertebrates, the lancelets (Leptocardii) and the round-mouths (Cyclostomata), not to mention the ignorant error of speaking of whales, etc., as "fish."

Form. It is almost impossible to describe the form of a fish in terms that would include all the different varieties, notwithstanding the fact that the group as a whole presents a greater uniformity of form than other vertebrate groups, e.g., birds. The majority, however, have a more or less elongated body, tapering at both ends. The variations in form can usually be correlated with the habits of the fish. The great variety of habitats into which the fish have been crowded, and to which they have become adapted, has resulted in great diversity of form, though this diversity is mostly concerned with detail, leaving, as stated above, a characteristic fish form as a whole. The typical symmetry of a fish is embodied in such forms as the trout.



FORMS OF SCALES.

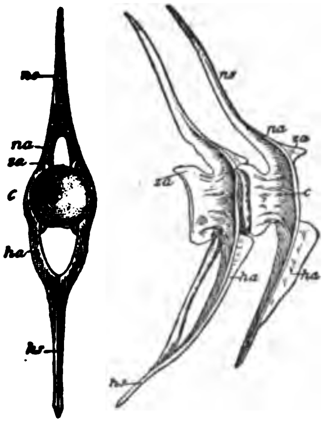
1, 2, cycloid scales; 3, 4, 5, 6, ctenoid scales; 7, ganoid scales; 8, 9, dermal papillæ (from *Monacanthus*); 10, 11, cycloid scales from lateral line.

Integument. Fishes are usually covered by scales or bony plates. These may become very minute, as in eels, or may be entirely wanting, as in the leather carp, in certain eels, and in many of the catfishes. Scales may be either bony or horny and are generally imbricated like slates on a roof, the free end being backward. They arise from the deeper layer of the skin, the derma, grow outward and backward, and remain covered by a thin layer of epidermis. Bony plates are attached by the whole of one surface and usually have a coat of enamel, which is derived from the epidermis, while the bony base arises from the derma. The differences of character in the scales have been made the basis of a classification of fishes by Louis Agassiz, according to whom all fishes are distributed into four orders, Cycloidei, Ctenoidei, Placoidei, and Ganoidei. This classification was very artificial and did not admit many intermediate cases, or the cases where more than one kind of scale was possessed by the same fish, and has long been disused, but it has been found very convenient in the study of fossil fishes. Here also it is giving way to a more natural classification. The dermal plates may become variously specialized, giving rise to spines, teeth, etc. The teeth vary greatly in size, shape, and arrangement. They may be flat, platelike, as in the rays, or long and sharp, as in certain sharks. The conditions in the sharks and in certain other groups show in the clearest way, by their structure and transitional forms, that they are merely modified dermal plates or denticles. In the more recent fishes they are not restricted to the edge of the mouth, but may occur in the roof and floor, and on the tongue, gill bars, and pharynx. The epidermis of fishes contains unicellular glands, which secrete the mucus covering their body, and pigment cells giving rise to the colors of the body.

OPEN MOUTH OF A SALMON.

Shows arrangement of maxillary, palatine, and vomerine teeth in fishes.

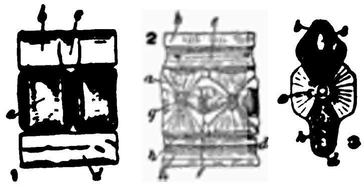
Skeleton. The skeleton of fishes consists of the skull with its visceral skeleton, the vertebral axis with its processes, the pelvic and pectoral girdles, and the supporting elements of the various fins. This in the lower cartilaginous fishes consists only of cartilage, no true bones being present. The skull, which in the higher fishes is a complicated structure, in the elasmobranchs consists of a rather simple cartilaginous hollow case, the chondrocranium, inclosing the brain, and not composed of distinct pieces. As one ascends the scale, bones are added to this chondrocranium from the outside, arising as dermal ossifications; these are probably merely highly modified dermal plates. In the ganoids the chondrocranium generally persists with centres of ossification present, and the whole head is incased in dermal bones. In the higher bony fishes the chondrocranium is usually replaced by cartilage bones with many dermal bones added. To the lower part of the skull in all fishes a series of arches are attached. These form the lower jaw and the hyoid and gill arches. The backbone generally consists of a series of vertebræ which, with the exception of Lepidosteus, are biconcave. Dorsally they bear neural arches inclosing the spinal cord, and these are prolonged dorsally as a neural spine, varying in length. Ventrally the vertebræ bear ribs in the anterior portion, and in the caudal region there are hæmal arches inclosing the caudal artery and vein. These arches are prolonged ventrally as a hæmal spine. In some elasmobranchs, in the chimæras, in the lungfishes, and in some ganoids, there are no such definite vertebræ developed, but the notochord, which in the teleosts persists only as remains in the cavities between the ad-



VERTEBRA OF A BONY FISH.

Front and side views. *c*, centrum; *na*, neurapophysis; *pa*, parapophysis; *ha*, hæmapophysis; *ns*, neural spine; *hs*, hæmal spine; *za*, zygapophysis.

joining centra, is a continuous rod. The neural and hæmal arches and the ribs are variously developed. In most of the elasmobranchs there are present definite biconcave vertebræ with neural and hæmal arches, transverse processes, and rudimentary ribs, but they remain cartilaginous or become only slightly ossified. The centra are pierced by a canal through which remains of the notochord are continuous. The posterior end of the spinal column forms the basis of the caudal fin. See SKELETON.



VERTEBRÆ OF A CARTILAGINOUS FISH.

1. Side view. 2. Longitudinal section. 3. Transverse section of caudal vertebra of a shark.

a, centrum; b, neurapophysis; c, intercrural cartilage; d, hæmapophysis; e, spinal canal; f, intervertebral cavity; g, central canal of persistent portion of notochord; h, hæmal canals for blood vessels.

The fins are supported by cartilaginous or bony rods. In the dorsal and anal these rods do not join those of the internal skeleton directly, but, embedded in the flesh, are interposed between the spinous processes of the vertebræ. The paired fins, not always all present, represent the typical fore and hind limbs of quadrupeds. They consist of a basal set of bones, varying in number and arrangement in the different groups, bearing the radiating fin rays, and articulating proximally with the pelvic or shoulder girdle. The girdles are cartilaginous in elasmobranchs, lungfishes, and sturgeons; but in teleosts this, like the chondrocranium, has additions in the way of dermal bones, which have become associated with it. The pelvic bones may be embedded in the muscles of the abdomen, or may occur farther anterior and become fastened to the pectoral girdle. In some fishes the pelvic fins, which answer to the hind feet of quadrupeds, are actually farther forward than the pectoral fins and are then called jugular. In some fishes, as in the common eel, the ventral fins are wanting, while in others both pairs may be absent. In lungfishes "the skeleton of the pectoral fin consists of a stout basal cartilage, an elongated, tapering central axis made up of a number of short cartilaginous segments, and two rows of jointed cartilaginous rays extending out on either side of the axis." See FIN.

Internal Structure. The *respiratory organs* of fishes consist of gills and, in the case of Dipnoi, of gills and lungs. In the region of the pharynx the alimentary canal communicates with the exterior on each side by a series of slits called gill clefts. The water passing through the mouth into the pharynx escapes to the exterior through these gill clefts. The bars bounding these clefts have attached to them the gills, which are merely the mucous membrane of the bars raised up into a number of ridges, called branchial filaments. These are highly vascular, the blood entering them being venous in character, and they constitute the true respiratory organs. The water passing through the clefts bathes the filaments and effects the necessary interchange of gases. In the lungfishes the air bladder has assumed the function of a lung. This organ is not a smooth-walled bag, as in other fishes, but a highly vascular, much-chambered organ. The air enters it through a connection with the pharynx. See GILL; RESPIRATORY SYSTEM.

The *air*, or *swimming, bladder* of fishes is a sac, usually unpaired, filled with gas and lying dorsal to the intestine. Embryologically it corresponds with the lungs, as it arises as a diverticulum of the intestine, and in this connection may persist as the pneumatic duct, or in other cases may be wholly lost. The function of the air bladder is not always clear. When it is supplied with venous blood, as in Dipnoi and Amia, and its gases are periodically exchanged for outside air, it doubtless functions as a lung. When it is supplied with arterial blood or when it is a closed sac, its function is supposed to be hydrostatic. It may, in addition, serve as a storehouse for oxygen taken in by the gills. The contraction and expansion both of the bladder and of the body musculature serve to condense and expand the air in the bladder and thus may aid the fish in rising or sinking in the water. Unequal anterior, posterior, or lateral pressure on the bladder may likewise aid the fish in directing its course. In some fishes the forked anterior end of the air bladder fits closely against the posterior wall of the auditory capsule. In carps and siluroids the bladder and auditory organs are connected by a chain of bones. Such connections doubtless enable the fish to become more keenly sensitive to any change in hydrostatic pressure in the bladder.

Except in teleosts, where a conus arteriosus is wanting, the heart of fishes consists of (1) a sinus venosus, (2) one auricle, (3) one ventricle, and (4) a conus arteriosus. In the teleosts the conus is represented by the bulbus arteriosus, which, however, is a part of the aorta and does not undergo rhythmical contraction like the conus. The sinus venosus is a thin-walled expansion of the afferent veins, and a sort of antechamber to the thin-walled auricle. From the latter the blood passes into the thick-walled, muscular ventricle, thence either into the ventral aorta (teleosts) or into the conus. From the conus the ventral aorta extends forward a short distance and then divides on each side into a number of branches (afferent branchial arteries), which pass through the gill arches, breaking up there into capillaries in the gill filaments, which recollect into the efferent branchial arteries. These unite above the pharynx as a single large artery, the dorsal aorta, which passes backward through the entire length of the body, supplying the different organs. The most important branches given off are the carotids to the head, the subclavian to the pectoral fins, the mesenteric and cœliac to the digestive organs, the renal to the kidneys, the spermatic or ovarian to the reproductive glands, and the iliac to the pelvic fins. Posteriorly the aorta is continued as the caudal artery. From the anterior part the blood is returned by the jugular vein; from the pectoral fin by the subclavian; from the digestive system by the hepatic portal to the liver; thence by the hepatic; and from the other portions of the body by the cardinal. All these enter the sinus venosus. Thus, in all except the lungfishes the heart contains only venous blood. All the blood on its course to the system passes through the gills first and is there purified. In the lungfishes, where the air bladder functions as a lung, some arterial blood reaches the heart from the air bladder by the pulmonary vein. This empties into the left side of the sinus venosus. The sinus venosus, the auricle, and the conus are imperfectly divided in the lungfishes, suggesting the condition in amphibia. The blood corpuscles of fishes are nucleated.

The *central nervous system* in fishes consists, as in other vertebrates, of a brain and spinal cord and the sympathetic system. The brain presents the usual divisions of the higher forms. It lies in the same plane with the spinal cord and exhibits no flexures. The brain does not completely fill the cranial cavity, and the intervening space is filled with the gelatinous arachnoid tissue. In the teleosts the optic lobes and the cerebellum constitute the largest divisions, the cerebrum remaining very poorly developed. In the elasmobranchs the olfactory lobes may be enormously developed. Ten cranial and many spinal nerves leave the brain and spinal cord. The sympathetic system presents the usual character and relations found in vertebrates. The emotions of fishes (manifestations of anger, fear, etc.), indicative of the mental status, are extensively considered in the *Proceedings* of the Zoölogical Society of London for 1878.

Sense Organs. Unequally scattered over the body of fishes there are the so-called "end buds," modifications of the epidermis. In structure these sense organs largely resemble taste buds, which in the vertebrates above fishes are restricted to the mouth cavity. In fishes these end buds are probably also taste organs, since it has been shown that a fish can taste with its skin. Besides these there are other aggregations of sense cells, probably tactile in function. Situated within longitudinal grooves or pits are sense cells, probably largely tactile in function, known as the lateral-line organs. These grooves open by definite pores to the surface. There is usually one series of such along each side, known as the "lateral line," but there may also be developed a more or less complicated system of grooves on the head. Many fishes have filamentous appendages, more or less definitely arranged around the mouth and nose, known as barbels. Cave-dwelling fishes, which have lost their power of sight, have strongly developed tactile papillæ on the head. The organs of smell are a pair of pits in the skin at the anterior dorsum of the head, lined with sense cells. There are no internal nares except in the Dipnoi, but the pits open to the surface by the external nares, each more or less completely divided into two, to permit the water to enter one, bathe the sense surface, and escape by the other. Fishes have no external and middle ear, but merely the inner, consisting of the semicircular canals, with their ampullæ, a sacculus, and utriculus. The otoliths are large. Various experiments point to the conclusion that the ear in fishes is merely an organ of equilibrium. The eyes have the usual structure of the vertebrate eye. The accessory organs, like the lids and lachrymal glands, are poorly developed. Eyes may be absent in cave and deep-sea forms. See NERVOUS SYSTEM, EVOLUTION OF.

The *digestive system* consists, as in other vertebrates, of the alimentary canal, with its more or less definitely marked divisions (mouth, pharynx, gullet, stomach, and intestine), and its glands, liver, gall bladder, and the pancreas. The mouth and its teeth present the greatest variety in form and arrangement. The pharynx opens to the surface by the gill clefts as above indicated. The gullet and stomach vary with the food habits of the fish. Predatory fishes swallow and stow away large objects. An extreme instance is the deep-sea fish *Chiasmodus niger*, which has been taken with a fish in its distensible stomach larger than itself. At the junction of the stomach and intestine, in ganoids and in nearly all teleosts, are given off a number of blind sacs, the pyloric cæca. These may be very numerous. The intestine in all fishes except teleosts has a spiral valve in the form of a ridge running spirally along the wall and projecting into the interior of the intestine. The alimentary canal opens either with the urinogenital ducts into a common chamber, the cloaca, or, as in teleosts, ganoids, and Dipnoi, separately to the exterior. There are no salivary glands. See ALIMENTARY SYSTEM, EVOLUTION OF.

The *excretory organs* in all fishes are a pair of glands situated just under the backbone and protruding into the body cavity. The excretion is carried away by a ureter, which empties variously in the different groups of fishes. In the elasmobranchs and Dipnoi the kidneys extend for about two-thirds the length of the body cavity, and the ureters, having united, open into the cloaca as a common duct. In the teleosts and ganoids the glands may occupy the entire length of the body cavity. The ureters open into a urinary bladder, and this into the urinogenital sinus, the latter opening separately to the exterior. See EXCRETORY SYSTEM, COMPARATIVE ANATOMY OF.

Reproduction. The sexes are separate. The testes and ovaries are paired organs varying in shape and position in the abdominal cavity with the different groups. The products of the male and those of the female may or may not be led to the exterior by a duct. In the male this may be a more or less convoluted vas deferens or a simple continuation of a bag. In teleosts the testes or ovaries are simply continued posteriorly as a duct which empties into the urinogenital sinus. In case there is no oviduct the eggs break free into the body cavity and pass into the urinogenital sinus by a pair of slits in the anterior wall. In ganoids there is always an oviduct. In the elasmobranchs and Holocephali there is an oviduct, usually quite highly developed, opening into the cloaca. In many teleosts and in nearly all elasmobranchs and Holocephali the eggs are fertilized in the body of the mother. In many instances the egg develops there to quite an advanced stage. In all other fishes the milt is poured over the eggs as they are extruded, or into the water in the immediate vicinity. In elasmobranchs and Holocephali the "claspers" act as intromittent organs, by which the milt is introduced into the body of the female. In the ovoviviparous teleosts the anterior portion of the anal fin is modified into an intromittent organ.

Breeding Habits. Fishes that lay eggs show no parental care, as a rule, either for their eggs or young. The eggs are fastened to rocks or weeds or other objects, and the eggs and young are left to shift for themselves. In many marine species the eggs are extruded into the water, and during their first period of development float at the surface and are carried about by the currents. In all such cases the loss both of eggs and young must be very great, and to meet this loss such species usually produce enormous numbers of eggs. Thus, a single large cod may produce in a single year 10,000,000 eggs. On the other hand, in some species there is considerable care bestowed upon the eggs and young by the parents—this duty usually falling to the male. The sticklebacks (q.v.) are well-known instances. The male builds a nest of sticks, grass, etc., cementing them together with a sticky excretion, and guards the nest and eggs during incubation. In some of the Siluridæ, after the young are ready to leave the nest, the male may be seen leading the brood about, guarding it until the individuals are better able to shift for themselves. This instinct is found in other families. The cave blindfish (*Amblyopsis*) retains the eggs during incubation in its capacious gill cavity. The sea horse develops a brood pouch along the ventral side of the body, in which the eggs and young are harbored. Many marine fishes, like the shad and the salmon, ascend the rivers each season to spawn. These migrations may be for great distances and against the greatest difficulties, such as rapids and falls. Such migratory species are known as anadromous fishes. The reverse process takes place in the case of the eel, which goes to the ocean to spawn.

The *spawning season* of most species is during the spring months. In the tropics, where the rainy and dry seasons alternate, these are determining factors in the time of spawning of certain species. Many species spawn during the colder months, e.g., the Salmonidæ. Many fishes show on the approach of the breeding season a noticeable sexual difference, the male being marked by more brilliant colors, or by the temporary growth of tubercles on the head and other portions of the body. Many species, however, do not exhibit this sexual dimorphism.

The eggs of fishes vary greatly in size and shape. The typical fish egg is globular, more or less transparent, having a tough protective membrane, within which the yolk-laden egg proper lies. The yolk is present in sufficient amount to maintain the embryo until it can swim about and feed for itself. The outer protective membrane is very commonly sticky, to enable it to cling to stones, weeds, etc. Sometimes eggs stick together in clusters. In other cases the outer coat has tufts of fine filaments with which the egg fastens itself to weeds. The shark's eggs are inclosed in large, horny, purse-shaped cases within which the embryo is developed. The period of incubation is very various. In certain pelagic eggs the embryo emerges from the eggs in 24 to 48 hours after deposit, while in other cases, as the trout, the period extends over three to six months. See EGG; EMBRYOLOGY.

Food. The food of fishes includes all sorts of vegetable and animal matter and forms. Some are omnivorous. Others are exceedingly choice about their food, living almost exclusively upon certain species of crustacea, for instance. Some, like the carp, are vegetarians, and the smaller fishes are the principal food of the larger, predacious forms, like the trout and bluefish. Many species subsist entirely upon the minute organisms they can strain out of the water.

Distribution in Space and Time. About 13,000 species of living fishes are known. In their distribution fishes are almost coextensive with water. The greatest variety is found in the tropics. Many families are exclusively marine, others as exclusively of the fresh water, while many have representatives in both, or spend a portion of their time in each. Certain groups, like the Cyprinodontinæ, are distributed only along the shallow shore waters; others, like the sharks and bluefish, are pelagic, living on the high seas, and such usually have a wide distribution. The ocean depths have their peculiar fish fauna—species modified for these peculiar conditions and unable to subsist at the surface. These species, living in darkness, often have no eyes, and many are phosphorescent. The coldest latitudes harbor their fishes. Some families, like the cod, are prevailingly distributed in colder waters, and certain species have been taken in lakes above the line of perpetual snow. Temperature is one of the important factors in determining the distribution of fishes. Deep-sea forms, where the temperature is uniform, have a wide distribution. The geological history of any region, with the changes in the river systems, etc., it has brought about, is another important factor. See DEEP-SEA EXPLORATION; DISTRIBUTION OF ANIMALS; CAVE ANIMALS; EVOLUTION.

Ancestry. The medium in which fishes live and the hard and almost indestructible nature of some portions of their skeleton, as their teeth, spines, and scales, would lead us to anticipate their frequent occurrence in the sedimentary rocks; but inasmuch as the soft parts of the animal are liable to speedy decomposition, the remains of fish must often exist in a fragmentary and scattered condition. Thus, the teeth in the shark, the spine defense in the sting ray, and the scales in the bony pike would survive the total destruction of the cartilaginous skeleton as well as the soft portions. Many quite complete casts of skeletons, however, have been obtained, so that not a little is known of the past history of the group. The earliest fishes occurred in the Upper Silurian. Remains of all of the main groups, excepting the higher teleosts, have been found from this period. Among the elasmobranchs the earlier forms were quite distinct from any now living, with the possible exception of the Port Jackson shark (q.v.). These forms flourished to the Triassic period, and in the case of the cestracionts to the Eocene. The recent elasmobranchs appeared in the late Triassic or early Jurassic, and were more abundant in the past than at present. The Dipnoi flourished in the Triassic. The ganoids were a dominant group up to Miocene times, but at present exist in mere remnants. The dominant fishes of to-day, viz., the higher teleosts, first appeared in numbers during the Jurassic and Cretaceous periods. These at the present day exhibit the greatest diversity in type. In times past the other groups presented this great variety of form, and it is mainly those species that retained the more generalized characters that survived and are present with us now. See EXTINCTION OF SPECIES.

Economic Value. By far the most important use of fishes to man is in supplying him with food, and in some regions they form the principal means of subsistence. Some fishes, nevertheless, are unpalatable, and even poisonous to a greater or smaller extent. The skin of some cartilaginous fishes yields shagreen, and the air bladder of some species yields isinglass. The minute laminæ which give brilliancy of color to some, and the similar substance found in the air bladder of others, afford the materials of which artificial pearls are made. Oil useful for lamps, etc., is obtained from several species, and the medicinal value of cod-liver oil is now well known. See FISHERIES.

Classification. *History of Ichthyology.*—Among the ancient students of ichthyology, that branch of natural history which treats of fishes, the first to be mentioned, as usual, is Aristotle. In modern times ichthyology began to be cultivated about the middle of the sixteenth century by Belon, Rondelet, and Salviani. Their work was of value locally only. The first work of real value, and which marks the beginning of a system based on scientific principles, was that of Willughby and Ray, which appeared in 1686 under the title *Historia Piscium.* Here a distinct effort at classification was made. They divided all fishes into two classes, Cartilaginei and Ossei. Each of these classes was divided into two groups, on the basis of the form of the body—the Cartilaginei into Longi, including the sharks, and Lati, including the skates; and the Ossei into Plani, including the flatfishes, and non-Plani, including all others. It is at once evident how artificial this classification is. Artedi, whose writings, on account of his death, were published by Linnæus, worked out a system of classification considerably influenced by Willughby and Ray. He included the cetaceans among the fishes. His system was adopted by Linnæus in his earlier editions of *Systema Naturæ*, but later (1758) Linnæus devised an original classification, which, among other changes, eliminated the Cetacea from the fishes and placed them with the mammals. The classification worked out by Bloch and Schneider was superficial in the extreme. The number of fins present was the basis of their division into Monopterygia, Dipterygia, etc. This work was published in 1801. Bloch, in 1782–95, published a large and important work on fishes, comprising nine volumes with fine illustrated plates, in which he described about 400 species. Several other authors wrote extensively on fishes during the last half of the eighteenth century and the beginning of the nineteenth. Among these is to be mentioned Lacépède, *Histoire naturelle des poissons* (5 vols., Paris, 1803), in which 1400 species were described. During the first quarter of the nineteenth century Cuvier did much on the classification of fishes, his system appearing in his *Règne Animal* (Bonn, 1830). The anatomist Johannes Müller published in 1846 a natural classification which influenced the systems to a very high degree. He divided fishes into Leptocardii, Marsipobranchii, Elasmobranchii, Ganoidea, Teleostei, and Dipnoi. Louis Agassiz (q.v.) advanced our knowledge both of living and fossil fishes. Influenced by the latter, he divided the class into four groups on the character of their scales: placoid, ganoid, cycloid, and ctenoid. This classification, though convenient in many ways for the study of fossil remains, was adopted by scarcely any of the authorities. Albert Günther, in his *Catalogue of Fishes in . . . the British Museum* (London, 1859–70), has largely modeled the modern system of classification. Among the more recent influential American ichthyologists are Theodore Gill, the late E. D. Cope, and David Starr Jordan, whose historical review of ichthyology in the *Proceedings* of the American Association for the Advancement of Science for 1902 is very complete.

Present Arrangement. The subphylum Vertebrata includes as the lowest in rank of its groups several series of fishlike vertebrates, divisible first into Acraniata (the lancelets [Leptocardii] only; see AMPHIOXUS), and Craniata, which includes all the remainder. The fishlike Craniata fall intó two classes:

I. CYCLOSTOMATA. Characterized chiefly by having "a suctorial mouth devoid of functional jaws" and by the absence of paired fins; these are the lampreys and hagfishes (orders Petromyzontes and Myxinoidei).

II. PISCES. Characterized by having the organs of respiration (gills) and the organs of locomotion (paired fins) adapted for an aquatic life. The class is divided into subclasses, as follows:

1. *Elasmobranchii.*—Pisces with a skeleton composed essentially of cartilage—the sharks, rays, etc., divided into three orders, Cladoselachea, Pleuracanthea, Acanthodea, and Selachii. The first three are represented by Paleozoic fossil forms. The last includes many extinct and all the existing forms.
2. *Holocephali.*—Sharklike Pisces, with a large compressed head and a single external branchial aperture. It includes only the family Chimæridæ (chimæras).
3. *Teleostomi.*—Pisces "distinguished from the Elasmobranchii and Holocephali by having the primary skull and shoulder girdle complicated by the addition of membrane bones, and by possessing bony instead of hornlike fin rays." This includes all of the common "bony fishes," as well as the so-called ganoid fishes. Its orders are: Crossopterygii (bichir, etc.); Chondrostei (sturgeons); Holestei (garpikes, etc.); Teleostei (bony fishes generally). The first three orders are frequently grouped together as "Ganoidei."
4. *Dipnoi.*—Pisces with lunglike respiratory organs as well as gills, and the fins constructed on the type of the archipterygium. It includes the lungfishes and by some authors is made a separate class altogether. Its orders are Monopneumona and Dipneumona.
5. *Ostracodermi* (q.v.).—A group of uncertain limits and affinities, known only from Paleozoic fossils, "characterized by the extraordinary development of the exoskeleton (bony plates) of the head, and the absence, in all the fossil remains hitherto found, of endoskeleton, including jaws."

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ton, 1896–1900); Goode and Bean, *Oceanic Ichthyology* (ib., 1895); Goode, *American Fishes* (New York, 1888); annual *Reports* and *Bulletins* of the United States Commission of Fish and Fisheries and of the National Museum (Washington, 1870 onward); governmental documents issued by Canada and Newfoundland; Eigenmann, *South American Fishes* (San Francisco, 1893); Yarrell, *History of British Fishes* (3d ed., London, 1859); Couch, *History of British Fishes* (ib., 1865); Houghton, *Fresh-water Fishes of Great Britain* (ib., 1879); Siebold, *Die Süsswasserfische von Mitteleuropa* (Leipzig, 1863); Blanchard, *Les poissons des eaux douces de la France* (Paris, 1866); Day, *Fauna of British India: Fishes* (London, 1889); Hutton and Hector, *Fishes of New Zealand* (Wellington, 1872). For fossil fishes, consult: Woodward, *Outlines of Vertebrate Paleontology* (Cambridge, 1898), in which is a full bibliography to the fossil forms; Agassiz, *Recherches sur les poissons fossiles*, vols. i–iii and supplement (Neufchâtel, 1833–44); Woodward, *Catalogue of Fossil Fishes of the British Museum*, vols. i–iii (London, 1889–95); and for American forms, Newberry, "Paleozoic Fishes of North America," in *Monographs of the United States Geological Survey*, vol. xvi (Washington, 1890).

FISH, HAMILTON (1808–93). An American statesman. He was born in New York City, graduated at Columbia College in 1827, studied law, and was admitted to the bar in 1830. In 1842 he was elected to Congress as a Whig. In 1846 he was the Whig nominee for Lieutenant Governor on the same ticket with John Young for Governor. During the campaign Fish antagonized the "antirenters" (see ANTIRENTISM), with the result that, although the Whig ticket was generally successful, he himself was defeated. In the year following, however, on the appointment of his successful Democratic competitor, Addison Gardiner, as a judge of the State Court of Appeals, a special election was held to fill the vacancy, at which Fish was elected. In 1848 he was nominated by the Whigs for Governor, and the result was a sweeping victory for Fish. In 1851 he was elected United States Senator to succeed Daniel S. Dickinson. The years 1857–60 he spent in Europe, returning in the latter year to take an active part in the campaign in behalf of the Lincoln ticket. During 1861–62 he was associated with other prominent citizens of New York on the Union Defense Committee, which coöperated with the municipal government in raising and equipping troops and in relieving New York volunteers and their families. Early in 1862 he was appointed, with Bishop Ames, a commissioner to proceed to Richmond and other Southern cities within the Confederate lines to relieve Federal prisoners; and although the Confederate authorities refused to allow them to proceed, the negotiations that followed resulted in an arrangement for the exchange of prisoners that was continued throughout the Civil War. In March, 1869, Fish was appointed Secretary of State and served through both of Grant's administrations, retiring in 1877. In 1871 he was one of the commissioners who negotiated and signed the Treaty of Washington with Great Britain. During the "Alabama Claims" arbitration he was successful in securing the adoption by the tribunal of a provision which relieved the United States from responsibility for indirect damages arising out of the Fenian raids and Cuban filibustering expeditions. He also brought about the settlement of the long-standing Northwestern Boundary dispute with Great Britain, which resulted in the cession to the United States of the island of San Juan (see SAN JUAN BOUNDARY DISPUTE), and the satisfactory settlement of the complications growing out of the *Virginius* massacre (q.v.). Under his direction, also, extensive reforms were undertaken in the consular service, by which civil-service examinations were required of candidates.

FISH, HAMILTON, Jr. (1849–). An American lawyer and politician, born in Albany, N. Y., the son of Hamilton Fish. He graduated at Columbia College in 1869, acted as private secretary to his father, and after his graduation at Columbia Law School (1873) was aid-de-camp to Governor John Adams Dix; he was Republican leader in the Assembly in 1890, and its Speaker in 1895. He was Assistant Treasurer of the United States in 1903–08 and a member of Congress in 1909–11.

FISH, NICHOLAS (1758–1833). An American Revolutionary soldier. He was born in New York City and began the academic course at Princeton, but left before graduating to pursue the study of law in the office of John Morin Scott in New York. There he became actively interested in the organization of the Sons of Liberty (q.v.) and in 1776 was appointed by Scott, who had been commissioned brigadier general, as aid-de-camp on his staff. At the close of the Revolutionary War he held the rank of lieutenant colonel. He was a division inspector under Steuben in 1778 and ably seconded that officer in his attempts to drill and discipline the continental troops. He participated in the battles of Saratoga and Monmouth, in Sullivan's expedition against the Indians in 1779, and in the Virginia and Yorktown campaigns, in which he served for a time on the staff of Lafayette. In 1786 he was appointed adjutant general of New York State, which position he held for many years. In 1794 he was appointed by Washington supervisor of the Federal revenue in New York City. In 1811 he was the Federalist candidate for Lieutenant Governor of the State, and carried New York City by a large majority. During the War of 1812 he served as a member of the City Committee of Defense.

FISH, NICHOLAS (1846–1902). An American diplomatist, grandson of Col. Nicholas Fish, and son of the Secretary of State, Hamilton Fish (q.v.). Born in New York and educated at Columbia and at Harvard Law School, he practiced law in New York City and then went into the diplomatic service. Appointed Second Secretary of Legation at Berlin (1871), he became Secretary (1874) and acted in the continued absence of his chief as chargé d'affaires, held the latter position in Switzerland (1877–81) and then served as Minister to Belgium (1882–86). He returned to New York in 1887 and became a member of the banking firm of Harriman & Co. He was president of the New York branch of the Society of the Cincinnati. He was fatally assaulted in New York City, Sept. 16, 1902.

FISH, ROYAL. Certain "great fish," as the whale and sturgeon, which by the common law of England are deemed the property of the crown when either thrown on shore or caught near the coast. The principle applied constitutes an exception to the rule, common to all systems of jurisprudence, that fish, as animals *feræ naturæ* ('of a wild nature'), belong by finding, or "occupation," to the one who first reduces them to possession. "Our ancestors," says Blackstone, "seem to have entertained a very high notion of the importance of this right, it being the prerogative of the kings of Denmark and the dukes of Normandy; and from one of these it was probably derived to our princes. It is expressly claimed and allowed in the Statute *De Prærogativa Regis* (17 Edw. II, c. 11), and the most ancient treatises of law now extant make mention of it." Strictly it was the head only of the whale which belonged to the King, the tail being a perquisite of the Queen Consort. In Scotland whales thrown on shore above six-horse-power draft belong to the Queen or the Admiral. See GAME LAWS.

FISH, STUYVESANT (1851–1923). An American banker and railroad official, born in New York City. In 1871 he engaged in clerical work for the Illinois Central Railroad, of which corporation he subsequently became director (1876), second vice president (1883–84), vice president (1884–87), and president (1887–1906). He also held high offices in connection with other roads, among them the Chicago, St. Louis, and New Orleans, from 1883 to 1906 was a trustee of the Mutual Life Insurance Company, and served as trustee of the New York Life Insurance and Trust Company, vice president and director of the National Park Bank, and director in other corporations. In 1904–06 he was president of the American Railway Association and in 1905 chairman of the seventh International Railway Congress. He published *The Nation and the Railways* (1908).

FISH AS FOOD. Fish is almost universally recognized as one of the important food materials and enters into the diet of very many if not most American families. From recent data published by the Bureau of Statistics, United States Department of Commerce and Labor, it appears that the total weight of the fish marketed yearly in the United States is 1,893,454,000 pounds, having a value of $54,031,000. By the processes of canning, salting, smoking, and otherwise preserving, the value of the fish is very much increased. In addition, thousands of pounds of fish are annually caught by sportsmen, but statistics of the amount are not available. Of the very large quantity of fish annually placed on the American market the greater part is consumed at home, although a portion is prepared in various ways for export. The preference for fresh-water or salt-water fish is a matter of individual taste. Both are, so far as known, equally wholesome. The market value of fish is affected by various conditions. Among these are the locality from which they come, the season in which they are taken, and the food on which they have grown.

Fish are sold either dressed or round, i.e., whole. Sometimes only the entrails are removed. Often, however, especially when dressed for cooking, the head, fins, and, less frequently, the bones, are removed. This entails a considerable loss in weight as well as of nutritive material. In dressing fish the following percentages are commonly lost: large-mouthed black bass, sea bass, cisco, kingfish, mullet, white perch, pickerel, pike, tomcod, weakfish, and whitefish, each, 17 per cent; small-mouthed black bass, eel, Spanish mackerel, porgy, and turbot, each, 13 per cent; butterfish, 12 per cent; shad, 11 per cent, and brook trout, 16 per cent; bullhead, 50 per cent; buffalo fish and lake sturgeon, 40 per cent; carp and sucker, 35 per cent; fresh-water sheepshead, 23 per cent; grass pike, black bass, white bass, yellow perch, and salmon, 15 per cent.

Fresh-water and salt-water fish alike are offered for sale as taken from the water, or preserved in various ways. Large quantities of fish are dried, salted, and smoked, the processes being employed alone or in combination. These methods insure preservation, but modify the flavor. Several fish products are also prepared by these processes. For example, caviar, prepared very largely in Russia, and to some extent also in the United States, is usually prepared from sturgeon roe by salting. The methods of salting and packing vary somewhat and give rise to a number of varieties.

When fish is salted or otherwise cured, there is a considerable loss in weight due to removal of the entrails, drying, etc. Codfish loses 60 per cent in preparation for market. If the market-dried fish be boned, there is a further loss of 20 per cent. The loss in weight of pollack is 60 per cent; haddock, 62 per cent; hake, 56 per cent; and cusk, 51 per cent. The canning industry has been enormously developed in recent years, and thousands of pounds of fish, oysters, clams, lobsters, shrimps, etc., are annually preserved in this way. Various kinds of fish extract, clam juice, etc., are offered for sale. There are also a number of fish pastes—anchovy paste, e.g.—and similar products which are used as relishes or condiments. Preservatives such as salicylate of soda were once employed to some extent with fish, and especially oysters, for shipping, but their use has been largely checked by State and national pure-food laws.

Oysters and other shellfish are placed on the market alive in the shell, or are removed from the shell and kept in good condition by chilling or other means. In the shell oysters are usually transported in barrels or sacks. Shipment is made to far inland points in refrigerator cars and to Europe in cold-storage chambers of vessels. Oysters are often sold as they are taken from the salt water. However, the practice of "freshening," "fattening," or "floating" is very widespread—i.e., oysters are placed in fresh or brackish water for a short period, in which they become plump in appearance, owing chiefly to the water taken up by their tissues. They have a different flavor from those taken directly from salt water. Lobsters, crabs, and other crustacea, though sometimes boiled before being marketed, are usually sold alive. Turtle and terrapin are usually marketed alive. Turtle soup, however, is canned in large quantities. Frogs, valued for their hind legs, are marketed alive or dressed in all seasons, but are in the best condition in fall or winter. In addition to the varieties of fish commonly used as food, others, such as the common sea mussel, smooth and horned dogfish, sand shark, and toadfish, which are not found in quantity in the American market, are also edible, and their use would add to some extent to the available supply of sea food.

The average composition of the principal fish, crustacea, etc., used for food is shown in the table below. That of others less frequently eaten is similar.

Fish usually contains less fat than is found in meat. There is, however, much difference in the fat content of the various kinds of fish. They may, indeed, be roughly divided into three classes: the first class would include those containing over 5 per cent fat; the second those containing between 2 and 5 per cent; and the third those containing less than 2 per cent. The first group would include such fish as salmon, shad, herring, Spanish mackerel, and butterfish; the second, whitefish, mackerel, mullet, halibut, and porgy; the third, smelt, black bass, bluefish, white perch, weakfish, brook trout, hake, flounder, yellow perch, pike, pickerel, sea bass, cod, and haddock.

When judged by its composition, the place of fish in the diet is the same as that of meat; i.e., it is supplementary to cereals and other vegetables, most of which, as wheat, rye, maize, rice, potatoes, etc., are rich in carbohydrates, which are not present in appreciable amounts in the flesh of fish. Preserved fish, as a rule, show a small percentage of refuse, with the exception of a few kinds which are preserved whole. The percentage of actual nutrients is much larger than in the corresponding fresh fish, owing to the removal of a large part of the refuse and more or less water. The gain in nutrients is mostly represented by protein, which is the most valuable nutrient. Canned fish, which is in effect cooked fish, compares favorably as regards composition with the fresh material. Generally speaking, the amount of refuse is small, since the portions commonly rejected in preparation for the table have been removed before canning. Shellfish resemble meat and food fishes in general composition. They contain, however, an appreciable amount of carbohydrates. Judging by the relative amount consumed, oysters are the most important of the shellfish. Speaking roughly, a quart of oysters contains on an average about the same quantity of actual nutritive substances as a quart of milk, or three-fourths of a pound of beef, or two pounds of fresh codfish, or a pound of bread.

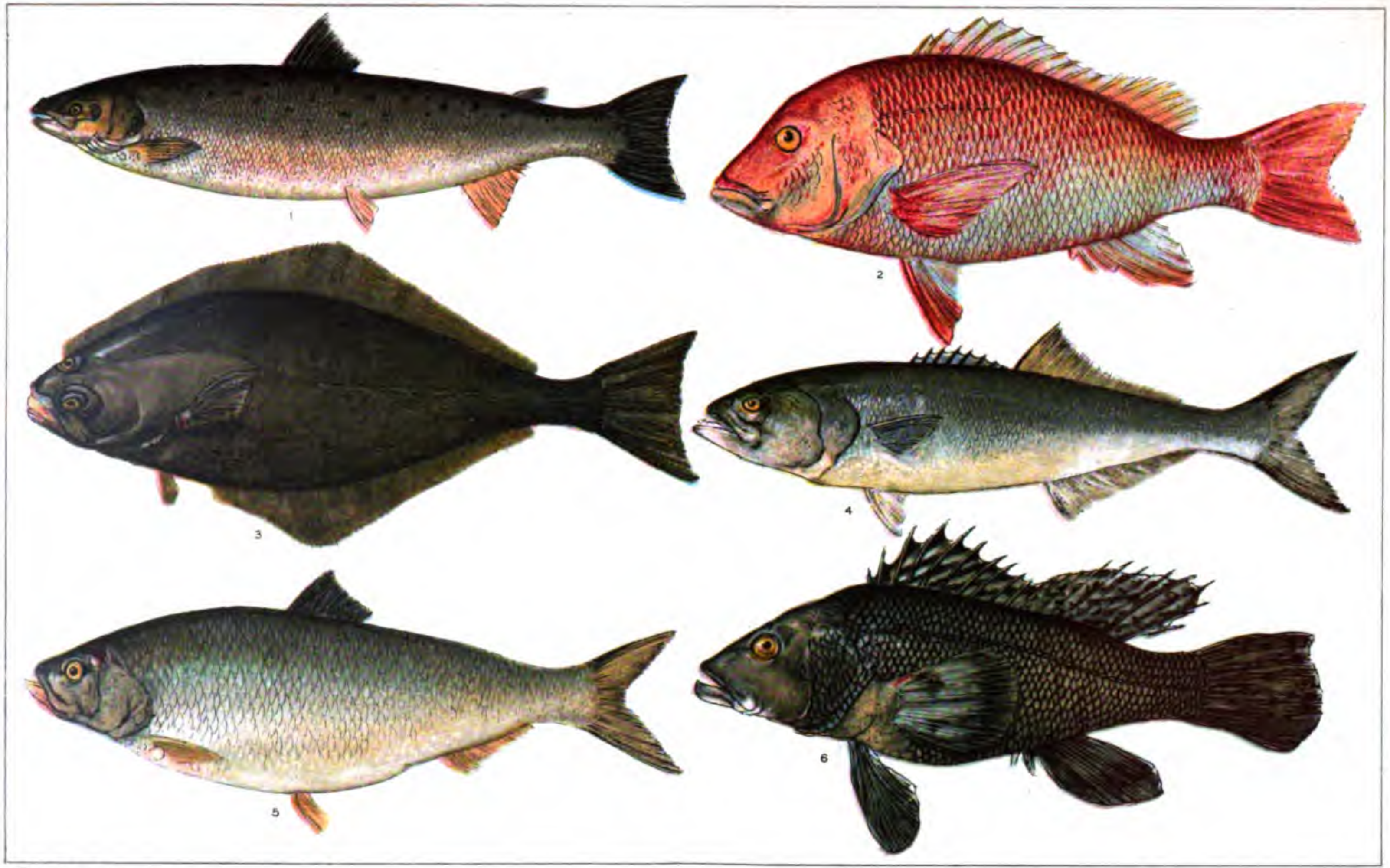
A number of experiments have been made with man to learn how thoroughly fish is digested and to compare it in this respect with other foods. It has been found that fish and lean beef are about equally digestible. In each case at least 95 per cent of the total dry matter, 97 per cent of the protein, and 97 per cent of the fat were retained by the body. Other experiments of the same character indicate that salt fish is less thoroughly digested than fresh fish. The nutritive value of shellfish, as of other fish, depends to a considerable extent upon their digestibility; but so little is known upon this point that nothing more can be said with certainty here than that oysters belong to the more easily digestible class of foods. So far as can be learned no experiments have been made which show how thoroughly crabs, clams, and other crustacea, turtle and terrapin, and frogs' legs are digested. Inspection of a considerable number of dietary studies of families of farmers, mechanics, professional men, and others, carried on in different regions of the United States, shows that out of the 20 per cent of the total food and the 43 per cent of the total protein obtained from animal sources, only about 2 per cent of the total food and 4 per cent of the total protein is furnished by fish, shellfish, etc., showing to what a limited extent this valuable food is used in the average household. It is not improbable that in communities where fishing constitutes the principal industry much larger quantities are consumed. It was found that the laborers employed in the fisheries of Russia consumed from 26 to 62 ounces of fish daily. This, with some bread, millet meal, and tea, constituted their diet throughout the fishing season. These quantities are unusually large, but no bad effects are mentioned as following the diet.

There is a widespread notion that fish contains large proportions of phosphorus and on that account is particularly valuable as brain food. The percentages of phosphorus in specimens thus far analyzed are not larger than are found in the flesh of other animals used for food. But even so, there is no experimental evidence to warrant the assumption that fish is more valuable than meats or other food material for the nourishment of the brain. The opinion of eminent physiologists is that phosphorus is no more essential to the brain than nitrogen, potassium, or any other element which occurs in its tissues. The value commonly attributed to the phosphorus is based on a popular misconception of statements by one of the early writers on such topics. It should be stated that most physiologists regard fish as a particularly desirable food for persons of sedentary habits, since it is easily digested and not too hearty. While, so far as can be learned, such statements do not depend upon experimental evidence, they are thought to embody the result of experience.

In cooking, fish may be boiled, steamed, broiled, fried, baked, or combined with other materials in some made dish. When boiled, it is stated that the loss in weight ranges from 5 to 30 per cent, a loss that consists largely of water—i.e., the cooked fish is less moist than the raw. Little fat or protein is lost. So far as known, experiments have not been made which show the losses by other methods of cooking. It is, however, probable that there would be usually a very considerable loss of water.

In view of statements of a popular nature which have been made on the dangers from eating poisonous fish or from ptomaines contained in fish, a few words summarizing the actual knowledge on these topics seem desirable. There are several species of fish which are actually poisonous. Few of them, however, are found in the United States, and the chances of their being offered for sale are very small. Such fish are mostly confined to tropical waters. Fish may contain parasites, some of which are injurious to man. These are, however, destroyed by the thorough cooking to which fish is usually subjected. Occasionally cases of illness which have been said to be ptomaine poisoning have been traced to eating fish or fish products. Fish which has been frozen and, after thawing, kept for a time before it is cooked is commonly believed to be especially likely to contain injurious ptomaines. It is possible, though, that the illness may be due to bacteria or their spores which are not destroyed by cooking. Canned fish should never be allowed to remain long in the can after opening, but should be used at once. There is some possibility of danger from the combined action of the can contents and oxygen of the air upon the lead of the solder or the can itself. Furthermore, canned fish seems peculiarly suited to the growth of microorganisms when exposed to the air. Finally, fish offered for sale should be handled in a cleanly manner and stored and exposed for sale under hygienic conditions. Oysters when "floated" or "fattened" should never be placed in water contaminated by sewage. Severe illness and death have resulted in a number of

AMERICAN FOOD-FISHES



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1 SALMON 1/10 NATURAL SIZE - SALMO SALAR
2 RED SNAPPER 1/5 " " - LUTIANUS AYA
3 HALIBUT 1/12 " " - HIPPOGLOSSUS HIPPOGLOSSUS
4 BLUEFISH 1/5 NATURAL SIZE - CHEILODIPTERUSSALTATRIX
5 SHAD 1/8 " " - ALOSA SAPIDISSIMA
6 BLACK SEABASS 1/4 " " - CENTROPRISTES STRIATUS

COMPOSITION OF FISH, MOLLUSKS, CRUSTACEANS, ETC., CONSIDERED AS FOOD

KIND OF FOOD MATERIAL	Refuse (bone, skin, etc.)	Salt	Water	Protein	Fat	Carbo-hydrates	Mineral matter	Fuel value per pound
FRESH FISH	%	%	%	%	%	%	%	*Calories*
Alewife, whole	49.5	....	37.5	9.7	2.5	....	0.8	285
Bass, large-mouthed black, dressed	46.7	....	41.9	10.3	.5	....	.6	215
Bass, small-mouthed black, dressed	46.4	....	40.1	11.5	1.3	....	.7	270
Bass, sea, dressed	46.8	....	42.2	10.1	.2	....	.7	195
Bluefish, dressed	48.6	....	40.3	9.8	.6	....	.7	205
Butterfish, dressed	34.6	....	45.8	11.7	7.2	....	.7	520
Cod, dressed	29.9	....	58.5	10.6	7.2	....	.8	205
Cod, steaks	9.2	....	72.4	16.9	.5	....	1	335
Cusk, dressed	40.3	....	49	10.1	.1	....	.5	190
Eel, salt-water, dressed	20.2	....	57.2	14.6	7.2	....	.8	575
Flounder, common, dressed	57	....	35.8	6.3	.3	....	.6	130
Hake, dressed	52.5	....	39.5	7.2	.3	....	.5	145
Haddock, dressed	51	....	40	8.2	.2	....	.6	160
Halibut, dressed	17.7	....	61.9	15.1	4.4	....	.9	465
Herring, whole	46	....	37.3	10	5.9	....	.8	435
Mackerel, dressed	40.7	....	43.7	11.4	3.5	....	.7	360
Mackerel, Spanish, dressed	24.4	....	51.4	15.8	7.2	....	1.2	595
Mullet, dressed	49	....	38.2	9.8	2.4	....	.6	285
Perch, white, dressed	54.6	....	34.4	8.7	1.8	....	.5	235
Perch, yellow, dressed	35.1	....	50.7	12.6	.7	....	.9	265
Pickerel, dressed	35.9	....	51.1	11.9	.2	....	.9	230
Pike, dressed	30.5	....	55.4	13	.4	....	.7	260
Pollack, dressed	28.5	....	54.3	15.5	.6	....	1.1	315
Pompano, dressed	45.5	....	39.5	10.2	4.3	....	.5	370
Red snapper, dressed	48.9	....	40.3	9.6	.6	....	.6	205
Salmon, California (sections)	5.2	....	60.3	16.5	17	....	1	1025
Salmon, Maine, dressed	23.8	....	51.2	14.6	9.5	....	.9	675
Shad, dressed	43.9	....	39.6	10.3	5.4	....	.8	420
Shad, roe	....	....	71.2	23.4	3.8	....	1.6	595
Smelt, whole	41.9	....	46.1	10	1	....	1	230
Sturgeon, dressed	14.4	....	67.4	15.4	1.6	....	1.2	355
Tomcod, dressed	51.4	....	39.6	8.2	.3	....	.5	165
Trout, brook, dressed	37.9	....	48.4	11.7	1.3	....	.7	275
Trout, brook, whole	48.1	....	40.4	9.8	1.1	....	.6	230
Trout, lake, dressed	35.2	....	45	12.4	6.6	....	.8	510
Turbot, dressed	39.5	....	43.1	7.9	8.7	....	.8	515
Weakfish, dressed	41.7	....	46.1	10.2	1.3	....	.7	245
Whitefish, whole	53.5	....	32.5	10.3	3	....	.7	320
General average of fresh fish as sold	42	....	44	10.5	2.5	....	1	300
PRESERVED FISH								
Mackerel, "No. 1," salted	33.3	7.1	28.1	14.7	15.1	....	1.7	910
Cod, salted and dried	24.9	17.2	40.3	16	.4	....	1.2	315
Cod, "boneless codfish," salted and dried	....	21.5	54.4	22.1	.3	....	1.7	425
Caviar	....	....	38.1	30	19.7	7.6	*4.6	1530
Herring, salted, smoked, and dried	44.4	6.5	19.2	20.2	8.8	....	.9	45
Haddock, "findon haddie," salted, smoked, and dried	32.2	1.4	49.2	16.1	.1	....	1	305
Halibut, salted, smoked, and dried	6.9	12.1	46	19.1	14	....	1.9	945
Sardine, canned	5	....	53.6	24	12.1	....	5.3	955
Salmon, canned	3.9	1	59.3	19.3	15.3	....	1.2	1005
Mackerel, canned	....	1.9	68.2	19.9	8.7	....	1.3	735
Mackerel, salt, canned	19.7	8.3	34.8	13.8	21.3	....	2.1	1155
Tunny (horse mackerel), canned	....	....	72.7	21.5	4.1	....	1.7	575
Haddock, smoked, canned	....	5.6	68.7	21.8	2.3	....	1.6	505
MOLLUSKS								
Oysters, solid	....	....	88.3	6.1	1.4	3.3	.9	235
Oysters, in shell	82.3	....	15.4	1.1	.2	.6	.4	40
Oysters, canned	....	....	85.3	7.4	2.1	3.9	1.3	300
Scallops	....	....	80.3	14.7	.2	3.4	1.4	345
Long clams, in shell	43.6	....	48.4	4.8	.6	1.1	1.5	135
Long clams, canned	....	....	84.5	9	1.3	2.9	2.3	275
Round clams, removed from shell	....	....	80.8	10.6	1.1	5.2	2.3	340
Round clams, canned	....	....	83	10.4	.8	3	2.8	285
Mussels	49.3	....	42.7	4.4	.5	2.1	1	140
General average of mollusks (exclusive of canned)	60.2	....	34	3.2	.4	1.3	.9	100
CRUSTACEANS								
Lobster, in shell	62.1	....	31.1	5.5	.7	....	.6	130
Lobster, canned	....	....	77.8	18.1	1.1	.6	2.4	395
Crawfish, in shell	87.7	....	10	2	.1	.1	.1	45
Crab, in shell	55.8	....	34.1	7.3	.9	.5	1.4	185
Crab, canned	....	....	80	15.8	1.5	.8	1.9	370
Shrimp, canned	....	....	70.8	25.4	1	.2	2.6	520
General average of crustaceans (exclusive of canned)	73.7	....	20.7	4.3	.4	.2	.5	100
TERRAPIN, TURTLE, ETC.								
Terrapin, in shell	79	....	15.6	4.5	.7	....	.2	115
Green turtle, in shell	76	....	19.1	4.5	.1	....	.3	90
Average of turtle and terrapin	77.5	....	17.4	4.2	.7	....	.2	105
Frogs' legs	32	....	57	10.2	.1	....	.7	210
General average of fish, mollusks, crustaceans, etc.	44	....	42.5	10	2.5	.1	.9	295

* Including added salt.

cases from eating raw oysters contaminated with sewage containing typhoid-fever germs.

For further information, consult the authorities referred to under FOOD; also Atwater, "The Chemical Composition and Nutritive Value of American Food Fishes and Invertebrates," *Report of Commissioner of Fish and Fisheries, 1883* (Washington, 1885); *United States Department of Agriculture, Office of Experiment Stations, Bulletin 28* (revised); Langworthy, "Fish as Food," *United States Department of Agriculture, Farmers' Bulletin 85* (Washington, 1905).

FISH'BERRY, or **FISHER'S BERRY**. A drug. See COCCULUS INDICUS.

FISH CROW. A small crow (*Corvus ossifragus*), common along the eastern coast of the United States from the Hudson River to Mexico. It is about 16 inches in length, and the plumage is glossed with violet blue on the back, changing to a more greenish tinge on the head and lower parts. It rarely leaves the coast and margins of tidal rivers—where it feeds on small animals and carrion found on the beaches and mud flats, or dexterously seizes floating morsels—except to make excursions in the spring to neighboring woods and fields in search of birds' nests, of which it is a persistent robber. It ascends the Mississippi and other large rivers long distances. Its flight and cry are easily distinguished from those of the common crow, and it does not form great flocks and move regularly to and from the shore, as does that species. It nests in trees, preferring pines. A similar but somewhat smaller and blacker species (*Corvus minutus*) inhabits Cuba. Compare CROW.

FISH CULTURE, or PISCICULTURE (from Lat. *piscis*, fish + *cultura*, culture, from *colere*, to cultivate). The breeding, rearing, transplanting, and protection of aquatic animals in order to maintain or increase their abundance. Literally the term applies only to the culture of fishes, but by judicial decision it has come to include also such forms as the lobster, oyster, clam, and other mollusks used as food or bait, frog, etc.

General Considerations. Increased market demand must be met by increased production. Fish culture is of special economic importance as an extension of the natural method of utilizing terrestrial nitrogenous wastes, and is based upon the fact that soluble chemical substances, the essential food of growing plants, wash from the land. In streams, lakes, and estuaries this plant food causes an abundant crop of microscopic plants and animals (plankton) (q.v.), which is the fundamental food supply of all aquatic animals. Cultivation of water areas offers close parallels with intensive agricultural practices and results. A vast improvement is promised as increasing knowledge of the habits and life history disclose special points of vantage in application of scientific methods, e.g., artificial fecundation of eggs, protection of eggs and young from enemies, segregation of various sizes to check cannibalism, development of methods of feeding, etc. Mollusk cultivation is simple and is carried on extensively in many countries, notably France, Holland, Japan, United States, Italy. About one-half of the world product of oysters results from cultural practices. Similar practices are being extended to numerous other species of food and bait mollusks. In general cultivation consists in catching the floating young (spat, or "seed"), transplantation of immature mollusks to prevent loss by overcrowding or to utilize food-bearing currents, destruction of enemies, etc. The maintenance of artificial ponds for the rearing of fresh-water fishes for food or ornamental purposes is a very ancient practice and is carried on by nearly every civilized nation. In China fish culture has been extensively practiced from ancient times. In Europe, and particularly in Germany and Sweden, pond culture is of considerable importance. In recent years, however, fish culture has become almost synonymous with the harvesting of eggs, their artificial fecundation, and the rearing of the young up to varying stages in hatcheries established for that purpose. This seems to have been an ancient custom in China, where the Europeans probably got their first ideas of modern pisciculture. Both in Europe and America the industry has become of such importance as to be more or less completely supported by government funds. In Europe the hatcheries, over 400 in number, are largely private enterprises, but such are as yet comparatively rare in the United States and Canada. The United States far surpasses all other countries in the extent of this work under government patronage. The Federal government supports 34 hatcheries at various favorable places, and one steamer, the *Fishhawk*, a sort of floating hatchery, exclusively used in the actual culture of fishes or in the investigation of problems pertaining thereto. The number of fish handled in 1913, either as eggs, fry, fingerlings, yearlings, or adults, aggregated 3,863,000,000. Of this number 85 per cent were fry. Besides these, many of the States support hatcheries for the particular fishes of importance in their territories. (See below.) The purpose of the governmental hatcheries is either to stock new waters with desirable species or to maintain by planting the supply in waters already tenanted.

In most species it is at present impracticable to carry culture much beyond the stage of hatching, or "fry," as the hatchings are called. This is true of all the strictly marine forms such as the cod and flatfishes. In many of the fresh-water species, such as the various salmons, bass, and sunfishes, they are often nourished and protected in suitable ponds until they have become 1 to 4 inches long—"fingerlings," as they are then called—before planting. They may even be carried for another year and planted as yearlings.

It is now established that waters thus stocked or replenished have not only been able to maintain their supply of fishes, but have greatly increased it. Pacific waters have been successfully stocked with Atlantic species, and almost exhausted streams in various parts of the United States have been successfully restored. In some species the eggs are not handled, but the spawning fishes are provided with favorable ponds for spawning purposes, where their eggs are protected from enemies, given suitable temperature, etc. This is the case with members of the Centrarchidæ, such as the black bass, which build a nest and guard the eggs during incubation. The young when hatched are either taken from the ponds and fed in suitable troughs until better able to shift for themselves, or are supplied with food in the ponds themselves. In certain species, however, where the anatomy of the oviducts permits, the eggs are artificially expelled from the body into suitable receptacles, in which they are fertilized by the addition of milt similarly obtained from the males. After a few moments the eggs are transferred to running water, where they are kept and taken care of until the embryos emerge. The exact method employed in fertilization, but especially the subsequent handling of the eggs during incubation, varies considerably with the character of the egg.

Treatment of Eggs. Nearly all fish eggs are spherical in shape. The true portion, which is heavily charged with yolk, is inclosed by a membrane varying greatly in character. This membrane may be adhesive to any foreign object or to adjoining eggs, or it may be supplied with various modifications of filaments which cause the eggs to become entangled with each other and with foreign objects, such as weeds. These properties necessitate different methods in their handling during incubation. Again, eggs may be pelagic, i.e., buoyant, lighter than the water, or heavy, sinking to the bottom. Some eggs, as those of the whitefish and shad, are only slightly heavier than water, i.e., semibuoyant.

Pelagic eggs belong to the cod, flatfish, mackerel, tautog, etc. Such eggs are incubated in a way quite different from the heavy eggs; in nature they are extruded in the water and rise to the surface, where they develop. Such eggs usually hatch in a very short time, from a few days to two or three weeks. The apparatus now used for hatching pelagic eggs is the McDonald tidal box. The water enters through the cheesecloth bottom and through a small hole at one end, the latter giving the water and eggs within the box a gentle rotary motion. By means of an automatic siphon the water is also made to rise and fall at short intervals, thus insuring a more perfect renewal.

Heavy eggs, as those of the salmon and trout, are spread out on small wire-bottomed trays. These are placed in tiers in long troughs, into which the water enters at one end and by an arrangement of partitions is made to flow from below upward through the tiers of eggs, thus bathing them, and flowing out at the opposite end of the trough. During development in these trays constant attention is necessary to avoid too strong currents through the troughs, thereby shifting the eggs, and especially to remove the dead eggs, which are attacked by a fungus, and, if allowed to remain, will speedily contaminate the whole lot.

Semibuoyant eggs, as those of the whitefish, shad, and perch, are hatched successfully in the McDonald jar. This has a rounded bottom, and the water is introduced by a glass tube extending through the lid to near the bottom. The water entering gently keeps the eggs in slow motion, to prevent them from "banking" or gathering in lumps. The water escapes through the top by a tube or a sort of spout, carrying with it the young as they emerge from the eggs.

Adhesive eggs, like those of the smelt, are first mixed with starch or "muck," to deprive them of their glutinous properties, after which they are handled like other heavy or semibuoyant eggs.

Treatment of Fry. The successful rearing of fry to later stages was for a long time a problem difficult of solution. This has now, however, been perfected with certain species, like the salmon and trout, to a very high degree. The kind and quantity of water and food and the prevention of diseases are the main points to consider. A large quantity of water at a low temperature is one of the essentials to rapid and healthy growth of most species, particularly the salmon and trouts. Limited numbers are put in long rearing troughs—usually the same in which they were hatched—and a large volume of water is introduced in one end. The fry when first hatched have a large yolk bag which supplies them with food for four or five weeks. About a week before the entire yolk is absorbed they are moved from the trays into rearing troughs. The time to begin feeding them must be ascertained by trial. If hungry, they will rise to a minute particle of food thrown on the surface of the water. At first it is essential to feed them at frequent intervals, and the quantity at a given time must be carefully gauged to prevent them from gorging themselves and to prevent any excess of food from decaying in the water. Liver chopped to very fine particles is the food commonly used. Later the amount of care necessary grows less, so that one meal per day suffices. Larvæ of flies and various crustacea are then fed to them, and when the fish reaches a considerable size coarsely chopped-up liver, hearts, and fish constitute the main food.

Eggs are not equally hardy at all stages of development. At the time when the eyes begin to show their pigment, or the eggs are "eyed," they are usually transported. This is done in trays, the eggs being properly covered and surrounded by sphagnum moss and kept at a low temperature. This permits the eggs to be transported for thousands of miles without any serious losses. Temporary hatching troughs are built in places out of the way, yet favorable for collecting eggs. The eggs are carried to the "eyed" stage and can then be safely transported to more commodious quarters for further development. The United States Bureau of Fisheries owns four cars especially equipped and exclusively used for the transportation of eggs and young fishes. They are supplied with tanks and cans and suitable means for aërating the water and controlling the temperature.

Bibliography. United States Fish Commission annual *Reports* (Washington, 1871 et seq.); United States Fish Commission *Bulletins* (ib., 1882 et seq.); various authors, "Manual of Fish Culture," *United States Bureau of Fisheries* (ib., 1900); Day, *Fish Culture* (London, 1883); Maitland, *On the Culture of Salmonidæ and the Acclimatization of Fish* (ib., 1883); Gobin, *La pisciculture en eaux douces* (Paris, 1889); id., *La pisciculture en eaux salées* (ib., 1891); Max von dem Borne, *Fischzucht* (Berlin, 1881); Reighard, *Michigan Fish Commission, Bulletin 7,* on bass culture; Armistead, *Angler's Paradise* (London, 1895); Bund, *Fishery Management* (ib., 1899); Stone, *Domesticated Trout* (Charlestown, N. H., 1877); Mather, *Modern Fish Culture* (New York, 1900); Townsend, *Cultivation of Fishes in Natural and Artificial Ponds* (ib., 1907); Meehan, *Fish Culture* (ib., 1913).

FISH'ER, or PENNANT'S MARTEN. The largest (except the wolverine) of the fur-bearing carnivores of the weasel family (Mustelidæ), called in books "Pennant's marten" (*Mustela pennanti*). It is found in forested and uncivilized parts of Canada and the northern United States, where it formerly ranged southward to Tennessee. It is about 30 inches long, besides the tail, which is 12 inches or so more. In color it is chiefly black, often with gray or brown tints towards the head. It is a fierce nocturnal animal, living chiefly on birds and small quadrupeds and having the general habits of the marten. Its fur in winter is good and is much used in Europe. The black tail was once a favorite ornament to the caps of the Polish Jews. It is called by the trappers *pekan*, *wejack*, or perhaps more commonly *black cat*. The name "fisher" is said to be due to the fondness of the animal for the fish with which early trappers baited their marten traps, but more probably arose from misunderstanding of its habits or confusion with the mink. It is a great nuisance to marten trappers whatever bait they use, but is itself taken without difficulty in large traps baited with meat. Consult Coues, *Fur-Bearing Animals* (Washington, 1877), and especially Seton, *Life-Histories of Northern Animals* (New York, 1909).

FISH'ER, ALBERT KENDRICK (1856–). An American biologist, born at Sing Sing (now Ossining), N. Y. He graduated from the College of Physicians and Surgeons (Columbia University) in 1879. In 1891 he was a member of the Death Valley expedition; for the next six years he made biological surveys in California, Nevada, New Mexico, Arizona, and other States for the United States Department of Agriculture, and in 1899 he joined the Harriman Alaska expedition. In 1906 he was placed in charge of the economic investigations of the United States Bureau of Biological Survey. He was a founder and vice president of the American Ornithologists' Union. He published *Ornithology of the Death Valley Expedition of 1891* (1893), *Hawks and Owls of the United States* (1893), and bulletins of the United States Department of Agriculture.

FISHER, ALVAN (1792–1863). An American portrait painter. He was born at Needham, Mass., and studied under an ornamental painter, whose influence on his style was unfortunate. He painted cattle pictures, landscapes, and portraits with such success that he was enabled to visit Europe in 1825 and study in Paris. Upon his return, finding no demand for landscapes, he painted chiefly portraits. He belonged to what is called the "Boston group" of painters and, together with Doughty, Harding, and Alexander, held a successful exhibition of pictures at Boston in 1831.

FISHER, ANDREW (1862–). An Australian statesman, born in Crosshouse, Kilmarnock, Scotland. He worked as a coal miner and in 1885 went to Queensland, where he was elected to Parliament in 1893 and was Minister of Railways in the Dawson ministry of 1899. After Federation he was elected to the Commonwealth Parliament from Wide Bay; in 1904 was Minister for Trade and Customs; in 1907 became leader of the Labor party; and was Prime Minister for six months in 1908–09, his party losing office partly because it lacked interest in Imperial defense. He formed a second and very powerful ministry in April, 1910, which was defeated at the general election of 1913, when Fisher resigned (June 20) and was succeeded by J. Hume Cook, Deakin's successor as leader of the Liberal party.

FISHER, CHARLES (1808–80). A Canadian statesman. He was born in Fredericton, N. B., and was educated at King's College. He afterward studied law, was admitted to the bar, and in 1837 was elected a member of the Legislative Assembly. He was a member of the Executive Council in 1848–51, was appointed a commissioner to codify the laws of the province in 1852, and was Attorney-General in 1854–61 and also during part of 1866. Fisher was a strong supporter of responsible government, and for many years was the stanch ally of Lemuel Allan Wilmot (q.v.) in the struggle which established that principle in New Brunswick. In the larger issues which precipitated confederation he was also deeply interested. His advocacy of federal union caused his defeat in 1865, when he was a candidate for the Legislative Assembly, but he was soon afterward elected and in 1866 was one of the representatives of New Brunswick at the Quebec Conference which passed resolutions favoring confederation. In the same year he was one of the representatives of his province at the conference in London, England, at which the terms of the federal union were finally considered and arranged. After the Dominion of Canada was formed in 1867, Fisher was a member of its first parliament. In 1868 he was appointed a puisne judge of the Supreme Court of New Brunswick, a position he filled until his death.

FISHER, CHARLES (1816–91). A comedian who began his career in England, but after 1852 was connected with the American stage. He was born in Suffolk, of a theatrical family, and made his début in 1844 at the Princess's Theatre, London. He came to this country to join William E. Burton, making his first appearance here as Ferment in *The School of Reform*. His subsequent active life was spent in three companies: with Burton from 1852 to 1861, Wallack from 1861 to 1872, and Daly from 1872 to 1890, when he retired. His best-known parts were Triplet in *Masks and Faces*, Sir Peter Teazle, Jaques, and Graves in *Money*. He was tall and dignified in appearance and an admirable player of old men. He died in New York. Consult Hutton, in *Famous American Actors of To-Day*, ed. by McKay and Wingate (New York, 1896).

FISHER, CLARA (1811–98). A popular actress; after 1834 the wife of the composer J. G. Maeder. She was born in London, July 14, 1811, and first made a sensation on the boards of Drury Lane when she was about 6 years old (Dec. 10, 1817) as Lord Flimnap, the Prime Minister of Lilliput, and in a part in *Richard III*. After 10 years of prosperity in various British theatres, her precocious versatility showing itself even in such an ill-chosen rôle as that of Shylock, she came with her family to America, where she made her appearance late in 1827. Her charms, both as an actress and as a singer, were largely those of manner. Ophelia and Viola were her best Shakespearean parts, and as Lady Teazle she won many successes. Consult the *Autobiography of Clara Fisher Maeder*, ed. by Douglas Taylor (Dunlap Society, New York, 1897), and Ireland, in Matthews and Hutton, eds., *Actors and Actresses of Great Britain and the United States* (ib., 1886).

FISHER, GEORGE JACKSON (1825–93). An American physician, born at North Castle, N. Y., and educated at the New York University Medical School. He was United States examining physician of the Seventh Brigade, New York State National Guard, from 1853 to 1873, and president of the New York State Medical Society in 1874. He succeeded Dr. Samuel D. Gross as the contributor of a "History of Surgery" to the *International Encyclopædia of Surgery* (1886), and published: *On the Animal Substances Employed as Medicines by the Ancients* (1862); *Diploteratology: an Essay on Compound Human Monsters* (1866); *Are Mal-*

formations or Monstrosities of the Fœtus in Utero ever Produced by the Power of Maternal Emotion? (1870); *A Brief History of the Discovery of the Circulation of the Blood* (1877); *Teratology* (1875); *Sketches of Some of the Old Masters of Anatomy, Medicine, and Surgery* (1880–83).

FISHER, GEORGE PARK (1827–1909). An American Congregational clergyman. He was born at Wrentham, Mass., graduated from Brown University in 1847 and Andover Theological Seminary in 1851. In 1854 he was appointed professor of divinity and college pastor of Yale College. In 1861 he was transferred to the professorship of ecclesiastical history in the Yale Divinity School; in 1901 he became professor emeritus. He was a famous teacher and a prolific writer. In 1898 he was president of the American Historical Association. He died Dec. 20, 1909. Among his works are: *Essays on the Supernatural Origin of Christianity* (1865); *History of the Reformation* (1873; new ed., 1906); *The Beginnings of Christianity* (1877); *Discussions in History and Theology* (1880); *The Christian Religion* (1882); *The Grounds of Theistic and Christian Belief* (1883); *Outlines of Universal History* (1885); *History of the Christian Church* (1888); *Manual of Christian Evidences* (1890); *Nature and Method of Revelation* (1890); *The Colonial Era* (1892); *Manual of Natural Theology* (1893); *History of Christian Doctrine*, in the "International Theological Library" (1896); *Brief History of the Nations* (1890).

FISHER, HARRISON (1875–). An American illustrator. He was born in Brooklyn, N. Y., and studied under his father, an artist, and at the Mark Hopkins Institute of Art, San Francisco. At the age of 16 he began his earliest illustrations for a San Francisco paper and was afterward appointed to the staff of *Puck*. He later illustrated for the *Saturday Evening Post, McClure's, Life*, and other magazines. Among the best known of the books illustrated by him are *The Market Place*, by Harold Frederic; *Three Men on Wheels*, by Jerome K. Jerome; *The Eagle's Heart*, by Hamlin Garland. His facility of execution is remarkable, and he is a faithful delineator of character. His well-known type of the "American Girl" is the usual idealized one popular in modern illustration. He excels in details of dress. In 1907 he published a collection of drawings entitled the *Harrison Fisher Book*.

FISHER, HERBERT ALBERT LAURENS (1865–). An English historian and educator, born in London. He studied at Winchester, at New College, Oxford, and in Paris and Göttingen. He was fellow of New College and of Winchester College and (1907) of the British Academy, and in July, 1912, succeeded Sir Charles Eliot as vice chancellor of Sheffield University. In 1912–13 he was a member of the Royal Commission on the Public Services of England. In 1909 he was a lecturer of the Lowell Institute in Boston. His principal works are: *The Mediæval Empire* (1898); *Studies in Napoleonic Statesmanship* (1903); *History of England, 1485–1547* (1906); *Bonapartism* (1908); *Life of F. W. Maitland* (1910); *The Republican Tradition in Europe* (1911); *Political Unions* (1911); and a short study, *Napoleon Bonaparte* (1913).

FISHER, IRVING (1867–). An American economist, born at Saugerties, N. Y. He graduated from Yale (A.B., 1888; Ph.D., 1891), where he remained as member of the faculty, becoming professor of political economy in 1898. He had spent 1893–94 in study at Berlin and Paris. From 1896 to 1910 he edited the *Yale Review*. He was a member of Roosevelt's National Conservation Commission. His publications include: *Mathematical Investigations in the Theory of Value and Prices* (1892); *Elements of Geometry*, with A. W. Phillips (1896); *A Brief Introduction to the Infinitesimal Calculus* (1897); *The Nature of Capital and Income* (1906); *The Rate of Interest* (1907); *National Vitality* (1909); *Introduction to Economic Science* (1910); *The Purchasing Power of Money* (1911; 2d ed., 1913); *Elementary Principles of Economics* (1911; 3d ed., 1912).

FISHER, JOHN (c.1459–1535). An English churchman. He was born at Beverley, Yorkshire, was educated at Michaelhouse, now incorporated with Trinity College, Cambridge, where he took his master's degree in 1491, and became master of the college in 1499. The same year Margaret, Countess of Richmond, mother of Henry VII, made him her chaplain and confessor. In 1501 he was elected vice chancellor of the university and in 1503 became the first Lady Margaret professor of divinity. In 1504 he was chosen chancellor of the university, and the same year he was appointed Bishop of Rochester. The Reformation of Luther found in him a strenuous opponent. He refused to declare the marriage between Henry VIII and Catharine of Aragon—whose confessor he was—illegal and thereby won the King's hostility. He opposed the suppression of the lesser monasteries in 1529 and the acknowledgment of the King as head of the church in 1531. He was imprisoned, and, refusing to take the oath affirming the legality of Henry's marriage with Anne Boleyn, he was committed to the Tower Feb. 16, 1534. He was treated with great rigor, and his bishopric was taken from him. While thus situated, the Pope, Paul III, as a recognition of faithful services and just merit, sent Fisher a cardinal's hat, in entire ignorance of his rupture with the King. The result was his ruin. He was accused of high treason and after a brief trial was condemned and executed June 27, 1535. Fisher's Latin works were published at Würzburg in 1597; an edition of his English works was begun by J. E. B. Mayor (vol. i, 1876) and continued by Ronald Bayne. Consult his *Life*, by Lewis, ed. by Turner (London, 1855), and by Bridgett (ib., 1890); also Mason, *Lectures on Colet, Fisher, and More* (ib., 1895).

FISHER, JOHN (1569–1641). An English Jesuit and theologian, really named Percy. He was born at Holmside, Durham, and was educated at the English colleges in Rheims and Rome and ordained in 1593. By 1594 he became a member of the Society of Jesus and soon afterward suffered religious persecution in Holland and England. Escaping from prison, he traveled to northern England as a missionary and was instrumental in the temporary conversion of William Chillingworth to Catholicism. Again arrested, in 1610, he was condemned to death, but was banished to Brussels instead and became professor at Louvain. He returned to England to be kept for three years in prison. He was an able debater with prominent Protestants and was favored for a time by the Stuarts; but the Jesuits were subject to severe penal laws, and he suffered further banishment, followed by imprisonment on his return. His published writings consist of theological disputations. Consult *Conference between William Laud, Archbishop of Canterbury, and Mr. Fisher, the Jesuit*, ed. by Simpkinson (London, 1901), a summary of a debate between the two in an attempt to influence the Countess of Buckingham, whom Fisher brought into the Roman church.

FISHER, John Arbuthnot Fisher, first Baron (1841–1920). An English naval officer. He entered the navy in 1854 and took part in the Crimean campaign of 1855 and in the China war of 1859–60. In the Egyptian campaign of 1882 he was captain of the *Inflexible* at the bombardment of Alexandria. From 1886 to 1891 he was Director of Naval Ordnance and in 1892–97 was Lord of the Admiralty. He was a delegate to the Peace Conference at The Hague in 1899 and commander in chief of the Mediterranean station from 1899 to 1902. In 1909 he was criticized by Lord Charles Beresford, but after an investigation he was raised to the peerage as Baron Fisher of Kilverstone, Norfolk. Early in 1910 he retired from his post as First Sea Lord of the Admiralty, but was reappointed in October, 1914. He acted as chairman of a royal commission (1912) on oil fuel for the navy.

FISHER, Joshua Francis (1807–73). An American author, born in Philadelphia. He graduated in 1825 at Harvard and was admitted to the bar in Philadelphia in 1829, but did not practice. He became an incorporator of the Pennsylvania Institution for the Instruction of the Blind and a student of questions of United States, in particular of Pennsylvania, history. His chief publication was *The Private Life and Domestic Habits of William Penn* (1836). He wrote also: *The Degradation of our Representative System and its Reform* (1863); *Reform of Municipal Elections* (1866); *Nomination of Candidates* (1868).

FISHER, Payne (1616–92). An English poet and political satirist. He was born at Warnford, Dorsetshire, and was educated at Oxford and Cambridge, but went soldiering to Holland in 1638. The following year found him in the English Royalist army, where he made the acquaintance of Lovelace and afterward fought under Prince Rupert; but after Marston Moor he joined the ranks of needy literary men in London. He grew in favor with the Parliamentarians and was Cromwell's poet laureate, writing Latin verse to order in a highly panegyric style. At the Restoration he merely changed his dedications, but, despite the satirical pamphlets he directed against his late patrons, he fell out of favor at court and died poor. In Fleet Prison he wrote *Tombs, Monuments, and Sepulchral Inscriptions* (1684), a prose description of landmarks which were destroyed in the great fire.

FISHER, Sydney Arthur (1850–1921). A Canadian statesman. He was born in Montreal, was educated at the Montreal High School and McGill University, and in 1871 graduated at Trinity College, Cambridge University, England. He early devoted himself to scientific farming, fruit growing, and the improvement of live stock. Though in 1880 unsuccessful as a Liberal candidate for the House of Commons, he was elected two years later, retaining his seat in the House until 1891. In 1896 he was again elected, and in the same year was appointed Minister of Agriculture in the cabinet of Sir Wilfrid Laurier, a position which he held until the defeat of the Liberals in 1911. In 1891 he was elected a member of the Quebec Council of Agriculture, and he was also one of the founders of the Provincial Fruit Growers' Association and became closely identified with several other organizations for the conservation and improvement of the farming interests of his province and of the Dominion. In 1909 he was appointed a member of the Royal Conservation Commission and in the same year was a Canadian delegate to the conference at Washington to consider the conservation of the natural resources of the American continent. In 1908 he was elected first vice president of the general assembly of the International Institution of Agriculture at Rome, Italy. While Minister of Agriculture he promoted important legislation. As a prominent temperance worker, he was for some time vice president of the Quebec branch of the Dominion Alliance. He was chief founder of the National Art Gallery and the Archives Bureau at Ottawa. He published: *Some Economic Aspects of Agriculture in Canada; Conservation of our Natural Resources; Rural Education in the Province of Quebec; Canada and its Position in the British Empire.*

FISHER, Sydney George (1856–1927). An American lawyer and writer, born in Philadelphia. He graduated at Trinity College in 1879, studied at the Harvard Law School for two years, and in 1883 was admitted to the bar at Philadelphia. Besides magazine articles, his popular writings on American history include: *The Making of Pennsylvania* (1896); *Pennsylvania, Colony and Commonwealth* (1897); *The Evolution of the Constitution of the United States* (1897); *Men, Women, and Manners in Colonial Times* (2 vols., 1898); *The True Benjamin Franklin* (1899); *The True William Penn* (1900); *The True History of the Revolutionary War* (1902); *The Struggle for American Independence* (1908); *The True Daniel Webster* (1911).

FISHER, Walter Lowrie (1862–). An American lawyer and public official, born at Wheeling, W. Va., and educated at Marietta (Ohio) and Hanover (Ind.) colleges. Admitted to the bar in 1888, he practiced until 1911 and after 1913 in Chicago, which city he served as special assessment attorney in 1888–89 and as special traction counsel in 1906–11. From 1911 to 1913 he held the portfolio of the Interior in President Taft's cabinet. He was president of the Municipal Voters' League (1906) and of the Conservation League of America (1908–09) and vice president of the National Conservation Association (1910–11) and of the National Municipal League. He published an *Address on Alaskan Problems* (1911) and *Alaskan Coal Problems* (1912).

FISHERIES. The capture of various kinds of fish for the purpose of trade has always been extensively carried on in maritime countries and in those which are watered by large rivers and has been the means in many instances of adding greatly to their prosperity. The art has been brought only by degrees to its present perfection, but in nothing did primitive man exhibit greater ingenuity and skill than in the taking of fish. These were effectively preserved and formed a large element in savage sustenance and barter in all parts of the world. The importance of fisheries in the food supplies of nations, inland as well as maritime, and as offering a remunerative return for labor, can scarcely be overestimated. The value of the food fish taken from the oceans and inland waters of the world amounts to nearly $400,000,000 per annum, or an average of more than $1,000,000 per day. One great peculiarity of this source of wealth is that the sea harvest is ripened without trouble or expense for the fisher, who only requires to provide the means of gathering it. But with increasing population the demand for food requires efficient methods not alone of capture, but of wise conservation of the sources of supply, based upon knowledge of the life histories and the interrelations of the food supplies of the various species of fish. Not only are the usual methods of fishing unnecessarily destructive of young and of breeding adults, but little thought is taken to destroy the enemies or to increase the natural food of the most valuable market fish or to prevent the destruction of the spawning beds. The coming of man as an enemy of the adult fish is causing changes in marine life and environment which, though for the most part unseen, are similar to those readily observable on land. The future development of the fisheries is likely to follow the closer utilization of waste products, more efficient methods of distributing and marketing fresh fish for food, elimination of unnecessary destruction of young and of breeding fish and of ripe spawn, commercial utilization of dogfish and other sharks for food, oil, and fertilizer, together with chemical treatment of their products to secure wider utilization. The fisheries will profit by legislation which aims to increase production, to preserve natural spawning grounds from depletion and pollution, rather than that which restricts the demand by prohibition of the use of improved apparatus.

Means of Capture. *Lines.*—The principal means of capturing fishes are the hook and line and nets. Hand lines are such as are manipulated with the hand. They have one or several hooks and are set, or sometimes are drawn or "trolled" through the water from a boat. The black bass, bluefish, pickerel (qq.v.), and other predacious species are taken by this method. The hand line is much used for ordinary fishing, but where this is carried on extensively at sea a "set" or "long" line must be used. This is known in America as a *trawl.* These set lines vary with the kind of fishing, but they are all built on the general plan of a long line, to which at intervals shorter lines bearing the hooks are attached. The line is weighted at the ends or at intervals. It may be provided with floats at intermediate distances, so that the hooks near the weights catch bottom fishes and the others those at middle depths. These lines, operated from dories or directly from the vessel, are set in varying lengths, but a well-equipped fishing schooner will operate several miles of trawl, carrying 10,000 to 15,000 hooks. The boats from which so extensive lines are operated are provided with winches to bring up the lines from the great depths.

Nets and Weirs.—The primitive weir of stones, plaited wood, etc., was early superseded by pliable nets of cord, which have become progressively more elaborate. The principal nets now in use are seine, purse seine, gill net, beam, and otter trawls. The seine is a long net of varying depth, weighted along the lower edge to keep this at the bottom, while the upper edge is provided with floats sufficiently strong to support the seine and keep it vertically stretched. It is usually intended to be dragged to the shore or to some prearranged platform; but many modifications have been devised to meet special conditions. One form for use in the open sea, called a "purse net," has a rope along the bottom by which that part may be gathered together, forming a deep bag, within which the fishes may be crowded into a small space near the surface and then dipped out. Pound nets and fyke nets are seines with a fixed location acting as traps. Pound nets consist of a long wing, or "leader," supported on stakes, and forming a fence which runs from near shore out to varying distances, and terminates in a labyrinthine inclosure forming a trap. Fishes swimming against the wing and seeking to pass around it are led out to the trap, entering which they are imprisoned. The pound net is simply a modern and improved form of the ancient weir (still in service in various parts of the world), which was composed of stakes and wattle or lines of planted brush instead of netting. Fyke nets are long, cylindrical bags, supported at intervals by hoops. The entrance is by a funnel leading into one or more compartments, separated by similar funnel-shaped partitions, through which the fish will not return. This net may be supplied with wings, like the ordinary pound net or weir, leading the fish into the funnel opening. Fykes are set at the bottom and may be used at considerable depths. Gill nets or drift nets are extensively used both in the seas and in inland waters, since they are suitable to any water of sufficient depth to float them properly. They are set or drifted across channels or across the course of migration of fishes. Schools of fishes, striking the net, will become entangled. This is one of the favorite methods for capturing species which move in schools at or near the surface, such as the herring, and which cannot be easily trapped or taken with the line. In America the "long line" is known as a trawl, but in England this term refers to a large, purse-shaped net attached to a front beam, which is weighted and dragged at varying depths near or along the bottom for bottom fishes, such as soles and flounders. This is one of the principal methods of fishing in the British waters. Trawls are often of great size, 75 to 100 feet in length, with a mouth which may exceed 100 feet in transverse diameter, and may be used at great depths, requiring vessels of considerable strength; but the "beam" trawl is now being superseded by the "otter" trawl, a similar but more efficient device. For the beam are substituted two "otter boards" which act like the runners of a sled. These boards are hung at such an angle on either side of the mouth of the baglike net, that when drawn through the water (usually running on the bottom of the sea) spread the mouth of the net. In Europe over 2200 powerful steamers equipped with otter trawls are engaged in the marine fisheries. The use of this latest type of machinery for harvesting the fish crop must be accompanied by corresponding intelligent activities to increase the productive capacity of the ocean. (See FISH CULTURE.) For information as to towing "intermediate" deep-sea nets and dredges, see DEEP-SEA EXPLORATION.

Preparation and Preservation of Fish. A matter of great importance to the fishery industry is the proper preparation of the raw product for the market. The markets are generally distant from the point of capture; moreover, the season during which any species can be taken in paying quantities is usually limited. This necessity has given rise to numerous methods of preservation, all of which are modifications of drying, salting, smoking in various degrees and combinations, and as later developments to canning, icing, and freezing.

In Drying, fish are usually first subjected to a salt cure, but under some circumstances may be directly dried. The process varies with different species, climates, and nations, but in general is as follows: The fish are cleaned and split. They are then salted, either with dry salt, allowing the pickle which forms to run off, or in brine vats, where they remain until ready for market. They are then subjected to the drying process in the sun, much care being essential to prevent too strong sunlight acting upon them. For markets in the tropics it is essential that most of the water be extracted, but for sale in the United States the fish are much less thoroughly dried.

For Pickling, brine is almost exclusively employed in the United States. The fish are cleaned, split, and packed in salt. Brine is then added. The principal fishes pickled are the mackerel and the herring.

Smoking Fish is an old and common practice. Smoking is a powerful preservative and adds a desirable flavor to the flesh. The fish are usually slightly cured with salt first, then smoked for a varying length of time—2 to 10 days. Oily species, such as the herring, haddock, halibut, salmon, etc., are those most generally smoked.

In Canning, the flesh is subjected to high temperatures (boiled), placed in cans, and hermetically sealed, after which the cans are subjected to water heated to a high temperature and under pressure. Fish may be (1) plain boiled or steamed; (2) preserved in oil; or (3) prepared in vinegar, sauces, and spices. Among the more important fishery products canned are the salmon, sardine, lobster, shrimp, crabs, oysters, and clams.

Freezing.—For transportation of fresh fish and for their preservation the freezing method is generally adopted. For transportation they are usually simply packed in ice. To preserve them for long periods in the fresh condition they are frozen into blocks of various sizes. The fish are packed into a pan of the desired shape and size, and then subjected to very low temperatures, either through the ice-and-salt method or by the ammonia method. Frozen into blocks, they are stored until ready for the market. By improved methods whereby evaporation is checked frozen fish should lose none of their good flavor and firmness during storage. On the Atlantic coast the bluefish, halibut, squeteague, sturgeon, mackerel, flatfish, cod, haddock, swordfish, red snapper, Spanish mackerel, eels, etc., are thus preserved. On the Pacific coast the salmon, sturgeon, and halibut are principally frozen. On the Great Lakes the lake trout, lake herring, wall-eyed pike, black bass, perch, sturgeon, etc., are frozen. The comparatively recent perfection of the methods of refrigeration has greatly increased the consumption of fresh fish and has enabled consumers to enjoy many species fresh at a season in which formerly they could be had only in a smoked or salted condition. The extensive inland trade in the United States, and the liability of stored products to rapid decay, have given rise to an elaborate system of refrigerator railroad cars for their imperishable transportation.

Special Fisheries. Special fisheries develop wherever the various species of fish resort in quantities either to feed or to breed. Such fisheries may be a permanent asset if the destruction of adults or young is not permitted to become excessive, if the natural mortality can be lessened, or if unwise destruction of other species which serve as food—e.g., young alewife, herring, menhaden—does not so reduce the supply that the more valuable fish—e.g., mackerel, pollack, bluefish, et al.—no longer resort there to feed.

The Sturgeon.—Sturgeons are the objects of rather extensive fisheries in both Europe and America; in China they are also important. In Europe the Russians lead in the sturgeon fishery. In the United States the industry is of comparatively recent origin, but is already rapidly declining because of the exhaustion of the supply through indiscriminate destruction of the fish of breeding age as they approach the spawning grounds. In the United States sturgeon are taken principally by the gill net and set lines, though many are also taken in pound nets and seines. The flesh is almost exclusively prepared by smoking, and in both Europe and North America the roe is prepared into caviar. The swim bladder is used for isinglass; oil is obtained, and the refuse is used as a fertilizer. From a maximum of 15,000,000 pounds in 1890 the yield of sturgeon in the United States has fallen to less than 1,000,000 pounds in 1913. In Russia the value of caviar is nearly $4,000,000 annually, mainly marketed in southwestern Europe. In the United States the production of caviar amounts to about $100,000 per annum.

Herring.—Under the head of herring fisheries may be considered all the clupeiform fishes, such as shad, herring, alewife, sardine, and menhaden.

The true herring, or sea herring (*Clupea harengus*), is undoubtedly the most important food fish in existence, although in the United States its importance is much less than that of many other species. The total annual catch for the world has been estimated at about 1,500,000,000 pounds, the greater part of which is taken in Norway. The annual catch in the United States is about 125,000,000 pounds, with a first value to the fisherman of $800,000. The herring are principally taken with seines, gill nets, and weirs. They appear in the markets in three principal forms, viz., fresh, pickled, and smoked. In the United States there are annually frozen about 20,000,000 herring, with a market value of about $250,000. About one-third of these are used as bait for cod; the remainder are consumed as fresh food. They thus afford an excellent fresh-fish food at seasons when other fresh fish are difficult to get. The quantity of herring prepared in pickle is greater than that of all other species combined. Over 3,000,000 barrels is the annual product for the world. They appear in the markets in two principal forms—"round" and "split." In the former they are salted without the removal of gills, heart, and viscera, while in the latter they are eviscerated. They are prepared for the markets as "hard" or "red" herring and "bloater" herring, the latter being a form and term used mainly in England and originating chiefly at Yarmouth. The former differ from the latter in being subjected to the smoke at a lower temperature and for three or four weeks, while the latter are smoked at a comparatively high temperature and only for two and a half to six days. The bloaters do not have the keeping qualities of the hard herring. In Maine young herring are extensively canned as sardines. In spite of the great increase in the herring fisheries and the enormous quantities annually taken, the abundance of the species has not perceptibly diminished, though, in part at least, this fact may result from the destruction by man of larger species, e.g., mackerel, pollack, bluefish, et al., which feed upon the young as well as upon the mature herring.

The Shad (*Alosa sapidissima*) is the object of the most extensive fisheries in the United States, where it is the most important food fish excepting the cod and the salmon. The original fisheries are located along the entire Atlantic coast streams. This fish, introduced by the United States Bureau of Fisheries into the Sacramento River, has spread along the entire Pacific coast northward to Alaska. Shad are taken during their entrance into the fresh-water streams for the purpose of spawning and are captured by seines, gill nets, and pound nets in great quantities. The annual yield for recent years has averaged about 25,000,000 pounds in the United States, with a first value of $2,000,000. The catch is diminishing in quantity, but the value is slightly increasing. Most of the shad are consumed fresh, being iced for shipment. A few are brine-salted, and some are smoked. The eggs of shad are to some extent made into caviar and offer the best substitute for the sturgeon roe.

The Alewife (*Pomolobus pseudoharengus*) is the most abundant food fish in the east coast rivers of the United States, and next to the shad is the most important of the anadromous fishes of the Eastern States. Alewife fisheries are to be found in every Atlantic State. The catch amounts to about 80,000,000 pounds per annum, with a value of $600,000. They are principally caught in seines and pound nets during their migrations up the streams for spawning purposes; many are also taken with gill nets, fykes, and even with dip nets. A nearly related species, the glut herring (*Pomolobus æstivalis*), is of less importance, and more common in the Southern States. Alewives are used fresh for food, as bait for line fisheries, and are extensively brine-salted and smoked.

The Menhaden is the object of an important fishery in the United States. This fish (*Brevoortia tyrannus*) occurs along the entire east coast of the United States and is more abundant south, but is of no special value as food except for other fishes. It is canned, and salted to a limited extent, and some are eaten fresh. Their principal value lies in the oil extracted from them and in their use as fertilizers. They are uncertain in their movements, but in favorable years over 50 vessels may be employed in the catch. The annual catch is about 400,000,000 pounds, valued at nearly $1,000,000.

The Sardine fisheries are pursued in three principal regions, viz., the Mediterranean coasts, the coast of the Bay of Biscay, and the coast of Maine; but sardines are prepared in other places, such as Brazil and Mexico. The European sardine, or pilchard (*Clupea pilchardus*), is the common form there. In the United States nearly related species are used, also the young of the sea herring, and to some extent young menhaden. This industry is of comparatively recent origin in the United States, dating from 1875. The European amounts are much greater, France, Spain, Portugal, and Italy being heavy producers. The importations of sardines and other fish packed in oil into the United States amount to about $2,000,000 per annum in value, and are chiefly from France, Italy, and England. In the markets sardines appear in the canned form, put up in olive and other kinds of oils. This industry has reached its highest development in Brittany.

Another group of important fisheries is that concerned with the several salmonoid fishes. Among these are to be included the salmon, whitefishes, and smelt.

The Salmon are undoubtedly the most important group of fishes entering the rivers of North America, and a considerable number of salmon are taken in northern Europe and eastern Asia. The catch of the British Islands in 1912 amounted to about 4,971,559 pounds. In North America the most important fisheries are on the Pacific coast. The most important species is the Chinook, or quinnat, salmon (see SALMON); the next in importance is the abundant blueback salmon, followed by the silver salmon, steelhead, etc. They are taken during their ascent up the streams by the usual appliances, together with the unique fishing wheel. Salmon are marketed as fresh, smoked, and canned. The canning of salmon has become one of the great industries of the world. Of the world's annual output over 95 per cent is prepared on the American continent. The salmon pack of the canneries of North America in 1913 was 8,063,447 cases (of 48 pounds per case), valued at $38,563,891; of which 3,475,000 cases, valued at $13,860,000, was Alaskan, 2,583,000 cases, valued at $13,320,000, Puget Sound, 288,479 cases, valued at $2,012,000, Columbia River, and 1,354,000 cases, valued at $8,800,000, British Columbian product. The export trade, at first mainly with South America and Australia, now also includes Great Britain and other European countries. The export of canned salmon ranges from 30,000,000 to 60,000,000 pounds per annum, valued at from $3,000,000 to $6,000,000 annually. Smoked salmon are among the choicest of fishery products, but the proportion of the salmon catch thus cured is extremely small.

The Whitefish (*Coregonus clupeiformis*) and the ciscos or lake herring (*Argyrosomus artedi*) are highly important salmonoids. Species of these two genera are found in the lakes of northern Asia, Europe, and North America, and all are valued as food. The whitefishes are among the most important fresh-water fishes of the world. The catch of lake herring and whitefish in the United States and Canada for the year 1908 aggregated about 25,000,000 pounds, with a value of about $1,500,000. Of this catch about 7,800,000 pounds were taken in the United States, with a value of $524,000. Most of these are taken in gill nets, but many also in pound nets, trap nets, and seines. Whitefish and herring are extensively frozen in the Great Lakes region and are thus served fresh to the markets. Large quantities were formerly brine-salted, but this industry has almost wholly disappeared since the frozen-fish industry has developed. Whitefish were formerly extensively smoked, but the scarcity of this species has resulted in the substitution of the lake herring.

The Lake Trout (*Cristivomer namaycush*) is next to the whitefish in importance in the Great Lakes fisheries. The disposition of these is much like that of the whitefish, and they are taken by gill nets, pound nets, hook and line, and in winter through the ice by spearing.

The Smelt (*Osmerus*), although the smallest of the salmonoids, is of great importance. The annual catch in the United States is about 4,000,000 pounds, with a value of $175,000. The catch in the Canadian fisheries aggregated over 10,000,000 pounds, valued at about $900,000 in the year 1912. They are largely taken by seines. Smelt are canned to some extent, but the great bulk of them are marketed fresh, being extensively preserved in cold storage.

The Mackerel is one of the most valuable food fishes in the Atlantic, and great fisheries for it are carried on in Great Britain, Ireland, Norway, Canada, and the United States. Lines, purse seines, and gill nets are the principal apparatus used. The most important of the several species, the common mackerel (*Scomber scombrus*), is found on both sides of the Atlantic and appears near shore in enormous schools. They appear in the spring, coming shoreward earlier in the more southern latitudes, and in autumn they return to the deeper waters. The European catch is usually limited enough to be mostly marketed fresh, but in the United States and Canada large quantities are cured. In North America most of the mackerel fisheries are on the east coast. The catch in the United States is now much less than formerly, and amounted in 1908, the latest census report on fisheries, to 12,742,000 pounds, valued at $864,000; that of Canada, in 1913, 11,400,000 pounds, valued at $635,293; that of England and Wales, in 1913, 34,000,000 pounds, valued at about $1,000,000. The world's catch so far as known amounts to about 125,000,000 pounds per annum, valued at approximately $5,000,000. In the United States the proportion of salted mackerel to the total catch was in former years above 80 per cent, but in recent years it has been much less. The increasing demand for fresh mackerel is in part responsible for this decrease.

The Spanish mackerel, one of the choicest food fishes, is taken in considerable quantities along its entire range on the east coast of the United States, but principally south. It is taken in seines, gill nets, pound nets, and lines.

The tunny, or horse mackerel, which may reach a weight of 1000 to 1500 pounds, is a mackerel of most excellent flavor and is the object of extensive fisheries in southern Europe. In California it is much sought by sportsmen, and is taken in considerable quantities off the coast of New England.

The Cod.—One of the world's greatest fisheries is that relating to the several species of the cod family (Gadidæ). These are common in the northern regions of both oceans. The more important species are the common cod, haddock, pollack, and hake. The countries principally engaged in the cod fisheries are Newfoundland, Canada, the United States, France, Great Britain, and Norway and Sweden, with a total annual product worth about $40,000,000. The common cod (*Gadus callarias*) is the most important and is found on both sides of the Atlantic. It is taken with hand lines and trawl lines from rather deep waters—20 to 70 fathoms. The annual catch for the United States has in recent years averaged about $3,500,000, first value. The catch in 1913 for Canada amounted to $8,368,000. The haddock is extensively taken in both Europe and America. The product of Canada amounted to $1,065,000 for the year 1913. In the United States the annual yield is about 60,000,000 pounds, with a value of about $1,300,000. The pollack is found on the east coast of North America north of New Jersey. The annual catch in the United States amounts to about $100,000, the Canadian product amounting to $325,000 in 1910.

The various species of cod are marketed fresh, dried, pickled, and smoked. Very small quantities are pickled in the United States, and almost the only species smoked is the haddock. The principal form in which they are cured is by salting and drying. The world's annual product of dried codfish aggregates 400,000,000 pounds, representing 1,500,000,000 pounds of the uncured fish. The chief markets are France, Spain, Portugal, Italy, and Brazil. The bulk of this trade is carried on by Norway, Newfoundland, and Canada, and it has been steadily increasing in these countries, while in the United States the reverse is the case. Our exports of dried cod in 1804 amounted to $2,400,000, while the average annual export for the 10 years prior to 1914 averaged less than $200,000 per annum. The total amount of dried codfish prepared in the United States annually is about 30,000,000 pounds. Haddock are extensively smoked, appearing on the market as "finnan haddie." The secondary products of the cod are of considerable importance. These are oil, isinglass from the air bladders, glue, etc.

Halibut, etc.—Nearly related to the Gadidæ, and like them of great importance, are the flatfishes (Pleuronectidæ). The fisheries are extensive in both Europe and America. Flatfishes are bottom fishes, and many of them are found in deep waters. The principal means of capture, therefore, are the hook and line, haul seines, pound nets, and the beam and "otter" trawl. The latter method is almost exclusively used by the North European countries. The most important of these fishes and one of the most toothsome is the large halibut, found in all northern seas. It may attain a weight of 400 pounds, though the commoner weight is less than half this. The great fishing grounds for the Atlantic trade of the United States are Grand Bank, Western Bank, Iceland, and Greenland. The Atlantic fishing has been seriously depleted by overexploitation. The chief source of supply of North America now is near the waters of Puget Sound and Alaska, with a reported catch of 35,000,000 pounds in 1912. They are iced, and upon arrival are further prepared for sale either fresh or smoked. The most of the halibut are cured by smoking. The annual product, larger now than in former years, averages about 34,000,000 pounds, with a value of about $1,600,000. The Canadian catch of halibut in 1910 amounted to 23,000,000 pounds, with a value of $1,240,486. Two other species of considerable size are found in the American markets: the Greenland halibut, found in the Arctic parts of the Atlantic but not very common, and the Monterey halibut, common along the coast of California. In European waters the sole (*Solea vulgaris*) is the common flatfish taken for the markets.

Mollusk Fisheries.—By judicial decision the taking of oysters, clams, quahogs, scallops, and other food and bait mollusks are "fisheries." In 1910 the oyster fishery alone employed over 67,000 persons, at a yearly wage of $11,000,000, an investment of $17,000,000, with an output of 33,000,000 bushels, valued at $15,000,000. Of this yield approximately one-half was the result of artificial propagation. See FISH CULTURE.

Lesser Fisheries.—In addition to the foregoing more important families of fishes there are many others whose species are not so generally important, and which are not the object of so extensive special fisheries.

The most important member of the minnow family in America and Europe is the carp. In Europe it is extensively reared in artificial ponds, and in the United States upon introduction it becomes notoriously abundant. Its flesh is not highly esteemed in the United States, though extensively taken for the markets, where it frequently appears under a variety of names.

The suckers (Catostomidæ) are much eaten in the Mississippi valley. The most important of these are the buffalo fishes, the catch of which in 1908 was 8,555,000 pounds, with a value of $215,000.

Of greater commercial value than the suckers are the catfishes (Siluridæ). The catch in the Mississippi valley amounted to 17,117,000 pounds in 1908, valued at $785,000.

The fresh-water sheepshead (*Aplodinotus grunniens*) yielded 2,637,000 pounds in 1908, with a value of $97,000. Along the east coast the salt-water sheepshead (*Archosargus probatocephalus*) is generally regarded as one of the choicest food fishes. The squeteague, or weakfish, and the spotted weakfish are extensively taken along the east coast of the United States.

The sea basses (Serranidæ) include many important species, used as food in different regions of their world-wide distribution. In the United States the striped bass (*Roccus lineatus*) and the white perch (*Morone americana*) are among the important species. The groupers are abundantly found in the markets, especially in the southern United States and in Brazil. These are not infrequently found of great size in the markets, but are of more practicable value as objects of sport.

Various species of pickerel (Luciidæ) are of some importance in the northern United States and Europe. The most familiar one is the common pike, or pickerel, abundant in northern regions. The Canadian maskinonge (q.v.) reaches a weight of 100 pounds or more.

Swordfish (*Xiphias gladius*) is a recently developed food fishery off the New England coast. In 1913 upward of 2,000,000 pounds were landed at Boston.

The large and small-mouthed black bass and other sunfishes, such as the rock bass, crappie, etc., are taken in considerable quantities for the markets in the United States, and the first named has been introduced into other countries where they are now marketed. The market value of the black bass to the fishermen in the United States is about $250,000, representing 3,000,000 pounds of fish. The annual catch of crappie is about 3,000,000 pounds.

The mullets are commonly found in the markets of both North and South America, the catch in the United States being about 35,000,000 pounds, valued at nearly $1,000,000 annually.

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FISHER'S ISLAND. An island about 6½ miles southeast of the harbor of New London, Conn., at the east entrance of Long Island Sound (Map: Connecticut, H 4). It belongs to Southold Township, Suffolk Co., L. I., and is about 8 miles long and 1 mile or less wide, with an area of about 4000 acres. The surface is undulating, the soil fertile and well adapted for agriculture. The island offers many attractions as a summer resort. Its permanent population is about 200. A considerable portion is occupied as a military reservation, and here is situated Fort Wright, which forms one of the defenses of the eastern end of Long Island Sound.

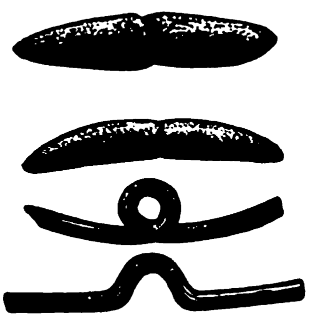
FISH FLY. One of a group of large neuropterous insects that pass their early stages in the water and are united into the family Sialidæ, of which the alder flies, dobson, and similar forms are also members. The name is more particularly given to the genus *Chauliodes*, which are distinguished from *Corydalis* by the comb-like or feathery feelers and reach a great size. The fish flies lay their eggs upon vegetation overhanging streams, whence the larvæ, as soon as hatched, drop into the water and go about preying upon aquatic animals. "When ready to transform to pupæ," according to Howard, "they crawl out upon the bank and are then found in cavities under stones or even under the bark of trees." See CORYDALIS.

FISHGUARD. A seaport and market town in the County of Pembroke, Wales, near the mouth of the river Gwaun, 14 miles north of Haverfordwest (Map: England and Wales, B 5). Its importance is due mainly to commercial possibilities furnished by an excellent harbor, and boats bound for Liverpool stop here to discharge London passengers. There are local fisheries of some value. In 1797 the so-called Fishguard Invasion by the French occasioned great alarm among the inhabitants, but the invaders were quickly repulsed. Pop., 1901, 1739; 1911, 2892.

FISH HAWK. The popular name in North America of the osprey (*Pandion haliaëtus*), of which it is considered a geographical race distinguished as the subspecies *carolinensis*. See OSPREY, and Plate of EAGLES AND HAWKS.

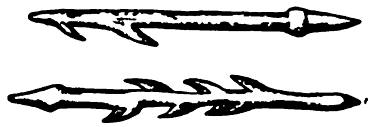
FISHING. Primeval man hooked and caught fish by the aid of numerous devices, the most important of which were gorges, made of bronze or stone, the latter consisting of pieces of shaped stone about an inch in length with a groove in the middle for the line. One of these gorges, a relic of the Stone age, has been discovered in France and is about 8000 years old. The bait completely covered the gorge, which, when swallowed by the fish, turned across the fish's gullet and held it secure. After stone, bronze was used and then bone. The early Californian Indians used shell hooks, while the Piute Indians used the spine of a cactus.

Fishing Tackle may be defined as consisting of rod, line, hook, reel, nets, etc. Rods are made of elastic wood and sometimes of steel.



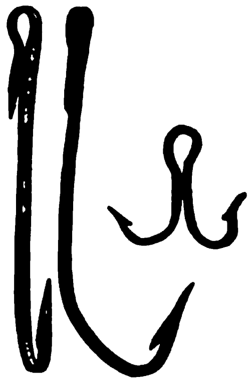
PRIMEVAL STONE AND BRONZE GORGES.

Split bamboo is especially adapted for fly fishing, and lancewood, greenheart, hickory, or ash for any other kind. Double-handed rods for salmon fishing are sometimes over 20 feet in length and weigh nearly three pounds. Most rods are made in sections or joints, so that they can be taken apart and the more easily carried. Fishlines may be of hair, silk, linen, hemp, or cotton, according to the purpose for which they are required.



ANCIENT FISHHOOKS (BONE).

There is a wide variety of hooks, not only for the different fish, but variations in design for the same fish, the choice depending on the skill and preference of the fisherman. Both the straight hook, in which the point is in line with the shaft, and the one in which the point is bent to one side, have their champions. Most hooks are made with flatted, ringed, knobbed, or plain ends.



ANCIENT BRONZE FISHHOOKS, DOUBLE AND SINGLE.

A particularly effective hook is the barbless hook, which has a sharp piece of wire fixed across the opening of the hook, making it almost impossible for the victim to get away after it has once impaled itself; such hooks, however, are little used. The *spoon hook* has a piece of polished metal shaped somewhat similar to the domestic tablespoon attached loosely to its shank, so that when it is drawn through the water it twirls and glitters in a manner designed to attract the fish, which, if it snaps at it, is likely to be caught by the hook. This tackle is used in trolling for bluefish, pickerel, bass, lake trout, and other game fish, although artificial flies, together with a number of hooks, are sometimes attached to the spoon. The *snell* is a piece of silkworm gut connecting the hook and the line. *Sinkers* are generally small pieces of lead, or bullets cut in half, and fastened to the line; *floats* are made of cork or wood and fastened to the line at both ends, serving to indicate to the fisherman the location of his hook and to indicate by their disappearance that a fish has seized the bait. There are many kinds of reels, including the automatic, which winds the line when a spring is pressed. The best tackle in the market and the most experienced fishermen are practically powerless without an effective bait, which ought to consist of some item from the known diet of the fish sought for, or, where that is not obtainable, of something closely resembling it. Beginning with the angleworm or common earthworm, the larvæ of insects, grubs, artificial flies, grasshoppers, etc., the list of available bait may be extended to various kinds of animal and fish flesh, as well as the numerous pastes common with the fishermen of Europe. The only *net* used by the genuine sportsman is the landing net, by which the fish is taken out of the water after it has been brought to shore or boat by the hook and line.

Fresh-Water Fish. The fish most common to amateur fishermen are the various minnows, in many places spoken of as shiners or chubs, of which the most generally known, the dace, is found in New England and the Middle States and demands but an ordinary light rod, with worm or artificial fly for bait. The sunfish or pumpkin seed, perch, bullhead, etc., may be found in ponds or still water throughout the United States, and sometimes in tidal rivers, and are caught with small hooks, with worms as bait, although (excepting the bullhead) they frequently take the artificial fly. In the Southern States good sport may be obtained with artificial flies in the catching of bluefish, blue bream, and copper-nosed bream. A peculiar, though uncertain, method of fishing for the common bream in these waters is to use bait made of brown bread and honey. For all-around sport through most of the year the yellow perch is most popular in the Eastern States. In summer it may be caught with a worm or minnow bait; and in winter holes are cut in the ice, and the white grub, usually found in decayed wood, is used as bait. In the springtime the fly is most attractive. The wall-eyed pike, as the pike perch is sometimes called, is found usually in the Southern States, western New York, the Great Lakes, and Canada, in which latter country it is known as the doree, another fish of the small species being known as the sandre. It is an exceptionally gluttonous fish, easily caught with a hook, and in Lake Champlain is occasionally caught by trolling. The pickerel, or common pickerel, which may be found in all the ponds and streams of the North, East, and Central States, together with the white pickerel of the Ohio and the black pickerel of Pennsylvania, are all distinguished by length of body. The pike seldom grows to be over 3 feet in length, although the maskinonge (like the pike, a member of the pickerel family) has been known in the Michigan lakes and the upper waters of the Mississippi River to be at least 7 feet. The fisherman usually trolls for them with a spoon. The common pickerel weighs on an average about five pounds. The largest catfish have been known to weigh over 150 pounds, although the flesh of the smaller kinds is the most rich and more generally considered a delicacy.

A fine game fish is the black bass (small or large mouthed), which is plentiful in many lakes and streams east of the Rocky Mountains. It may be caught with minnows, frogs, grasshoppers, etc., or with an artificial fly, or by trolling with a spoon hook. The fishing rods required for this fish are usually about 10 feet long and considerably stouter than those used for trout. The sucker is a fish found in all the fresh waters of the Northern States. It is usually caught with angleworm bait, and in the winter, through the ice, it is more easily caught than any other. The carp is a comparatively recent importation from Europe and is now found in many of the Eastern waters (where it frequently becomes a nuisance) as well as in California and Oregon. It haunts muddy waters. The chub is widely distributed in fresh waters and may easily be caught with various baits. The grayling affords exceptionally fine sport. It is generally caught with the fly, but will also bite at worms and insects, and is found along the northern border of the United States. The true salmon is caught chiefly in Canadian rivers as well as in the Penobscot River of Maine. The best time for sport ranges from about the middle of May to the end of July, covering a period when the fish is on its annual pilgrimage from the sea to deposit its spawn or eggs in fresh water. The newly hatched fish are known as pinks, in their second year as smolts, and in their third year as grilse. Artificial flies are the bait commonly used. Trout, second only to salmon in their gameness, are also sea emigrants whenever it is possible for them to be so. They are usually found to best advantage in clear streams and lakes, and angleworms, artificial flies, and minnows are used for their capture. In the rivers and lakes of Maine and Canada speckled trout of from four to six pounds are frequently seen, and specimens have been caught weighing nearly 10 pounds. The lake trout is caught by trolling, with a minnow or spoon as bait. Eels are best caught at night, along muddy bottoms; the fresh-water kind are commonly taken on "set lines," and the salt-water variety frequently captured in eel-pot traps.

Salt-Water Fish. The blue perch, nibbler, chogset, salt-water perch, or burgall, names frequently applied to the cunner, is found in great abundance along the coast. It is easily caught with but light tackle and almost any kind of bait, although clam bait seems to have a special attraction for it. The striped bass, or, as it is sometimes called, rock bass, is one of the best game salt-water fishes in the United States. It spawns in tidal rivers and will often make its way up fresh-water streams in its search for food. Its weight ranges from 8 to 75 pounds, and the bait required may consist of anything from a piece of cotton to a small fish. (See Bass.) It is sometimes caught with the artificial fly, and again a line baited with small fish thrown into the surf as in fly casting will be successful. The minnow is the best bait for trolling. It is very strong, very cunning, and very game, making long and fierce runs, severely taxing the skill and strength of the fisherman before it is finally subdued and captured. One of the most common fishes in the South is the sea chub, frequently called the Lafayette, owing to the fact that it was found in special abundance in 1824, the year of General Lafayette's visit to this country. The fish most common to all the coasts of the United States in the last half of the year is the weakfish, which in the South is occasionally mistaken for the trout. With this fish the clam is the most attractive bait, and the best time for catching is usually during flood tide. It varies in weight from six ounces to over seven pounds, occasional specimens having been caught weighing over 26 pounds. The fish has a large mouth and very soft jaws and is caught with much the same tackle as is used for black bass, the principal requirement being a large hook made of fine steel. Its peculiarity as a food fish lies in the fact that it must be eaten almost immediately after capture or its flesh will become soft. The sheepshead, a Southern fish weighing about eight pounds, is an exceptionally hard fish to secure, but is of correspondingly rare delicacy as a food fish and is one much valued by epicures. The scup, known in some parts as the porgy, or paugie, is found more particularly along the Atlantic coast.

Another gamy fish is the bluefish (q.v.), also known as the skopjack, horse mackerel, or (when young) snapper. Bluefish are found anywhere on the American coast between Massachusetts and Brazil. They are best caught with a squid trolled from a sailboat and occasionally from a line thrown out from shore. If they are running in "schools," the fishermen take them in great abundance with their trolling lines. A peculiarity about them is that they keep near the surface and will snap at any living thing in sight. Like the weakfish, they suffer in value for eating purposes if kept very long before cooking. A smaller kind of bluefish is caught along the New England shore with a light tackle and a minnow bait. Along the north coast of New Jersey the smelt is caught in large seines; they spawn under much the same conditions as the salmon. The umbrella tackle used in the State of Maine is a very peculiar as well as effective method of catching the smelt. The umbrella frame is attached to the end of a fish pole, and hanging from the end of each rib is a short line and hook. Mackerel afford excellent sport and may be fished for with hooks baited with small pieces of mackerel flesh or skin, although they are more generally taken in seines. The herring is the most common victim of commercial fishing, but it may also be caught by the individual fisherman in the springtime of the year with an artificial fly as bait. Its near relative, the shad, will also give very excellent sport when fished for with the fly. The king of the herring is the tarpon, which frequents the Gulf of Mexico and the coast of Florida. They vary in weight, but often exceed 150 pounds. They are caught on rod and line as also are the leaping tunas of the Pacific coast, gigantic mackerel, equaling in size and weight the tarpon. The blackfish weighing from two to nine or 10 pounds, and caught by a bait of soft clams, or bits of lobster, with either hand lines or rods, may be found between South Carolina and Massachusetts Bay. In some parts it is known as the tautog (q.v.). Its favorite running places are near sunken wrecks, deserted docks, or where the coast is of rocky formation.

The fish above mentioned are the ones which may legitimately be classed as game fish; most of the others, usually deep salt-water fish, as cod, haddock, whiting, and halibut, being caught principally for the market and as a means of livelihood. (See Fisheries.) Sharking (q.v.) is occasionally indulged in off the eastern coast of the United States and sometimes as far north as Nantucket Island. Every State in the Union has its separate fish laws, which, however, are constantly changing in a matter of detail, although their general principles remain the same. Some fish are protected by law from capture by netting, spearing, or any other method except hook and line, and then only during certain months known as the "open season." In some States it is unlawful to take fish under a regulation size or weight, and fines and imprisonments are penalties imposed for the transgression of such laws. In brief, the general trend of the law throughout the United States is to prevent the employment of any method which will destroy the supply. The reader is further referred to Angling; Bait Fishing; Fishing Laws; Fly Casting; Game Laws; Graining; Salmon Fishing; Sharking; Swordfishing; Tarpon Fishing; Trolling; Trout Fishing.

FISHING BIRDS. Birds subsisting by catching fish and adapted in structure to their capture and digestion. They do not constitute a scientific group, many widely dissimilar forms having taken up and become adapted to this mode of life, not to include such out-of-the-way species as the kingfishers and certain fish-eating birds of prey. The fishing birds proper include the larger sea birds, such as the loons, penguins, auks, puffins, tropic birds, frigate birds, cormorants, and gannets; and certain fresh-water families of higher organization, such as the pelicans, darters, most herons, and some ducks. All are either powerful swimmers and divers, or else are skillful in lying in wait and snatching or piercing any fish that comes sufficiently close to their motionless forms. The instrument (except in the Raptores, which use their talons) is the beak, which is long, straight, sharply pointed, and sharp-edged, so that a firm grip may be had of the slippery bodies of their prey. A large part of the prehistoric birds were fish catchers. Many of the fishing birds have a special provision for bringing home a part of their catch to their young, either by swallowing it as far as the crop, whence it may be disgorged, or by storing it in a bag formed by the distensible membrane between the lower mandibles (e.g., pelicans). Certain more powerful birds (as the jaeger gulls) profit by the labors of the fishing birds, compelling them to give up their prey; and men have trained the cormorant to exercise its skill for their benefit. See Cormorant; Gannet, and other birds of this group; and Plate of Fishing Birds.

FISHING BOUNTIES. It was the policy of the English government to encourage the fisheries, as schools for seamanship, in order that the navy might be readily manned in times of emergency. In the reign of Edward VI we find statutes compelling people to keep the fast days of the old church, although Protestantism had already been introduced. This was to keep up the demand for fish. A statute of Elizabeth went further and removed all import and export duties from fish, and another statute of the same reign encouraged by similar exemption the Iceland trade in herring and cod. In the eighteenth century this legislation had its desired effect of excluding the Dutch from the fishing trade in England, except in the case of the whale fisheries. To meet the latter difficulty, bounties were offered in 1733 and again in 1740 and 1749 to the owners of vessels engaged in the whale fisheries. These bounties were considerable, amounting in 1755 to £55,000, but they did not have the desired effect of increasing the industry.

Following these precedents and others of Colonial times, the American Congress offered bounties to promote the fishing industry. In 1789 bounties were given for the export of dried, salted, and pickled fish; these were increased in 1797 and 1799. An Act of 1792 offered extensive bounties to vessels engaged in the cod fisheries of Newfoundland. They varied from $1.50 to $2.50 on the ton, according to the size of the vessel, three-eighths of which went to the owner and the rest to the fishermen. These bounties were finally abolished in 1854. Consult: *Statutes of the Realm*, 2 and 3 Edw. VI, c. 19, 5 Eliz. c. 5; Cunningham, *Growth of English Industry and Commerce*, i, 443–444; ii, 21–22, 115–116, 282–284 (Cambridge, 1892). For American legislation, consult *United States Statutes at Large*, i, 229 et seq., 260, 533, 692.

FISHING CAT. A species of wild cat (*Felis viverrina*), common in eastern India and through Burma and the Malay Peninsula. It is 30 to 32 inches in length of body, to which must be added 9 to 12 inches of tapering tail. The general color is dark gray, sometimes reddish, striped on the head and neck and spotted elsewhere with dark brown; the throat and breast are white, and the tail barred with chestnut. The peculiarity of this cat is that it subsists mainly upon fish and mollusks of its own catching, but it is said also to be exceedingly fierce and to carry off children. Consult Mivart, *The Cat* (New York, 1892), and Lydekker, *Game Animals of India, Burma, Malaya, and Tibet* (London, 1907).

FISHING CREEK, Battle of. See Mill Springs, Battle of.

FISHING EAGLE. A large eagle (*Polioaëtus ichthyaëtus*) of India and eastward, which lives by catching fish, having habits and a conformation of claws very similar to those of the osprey.

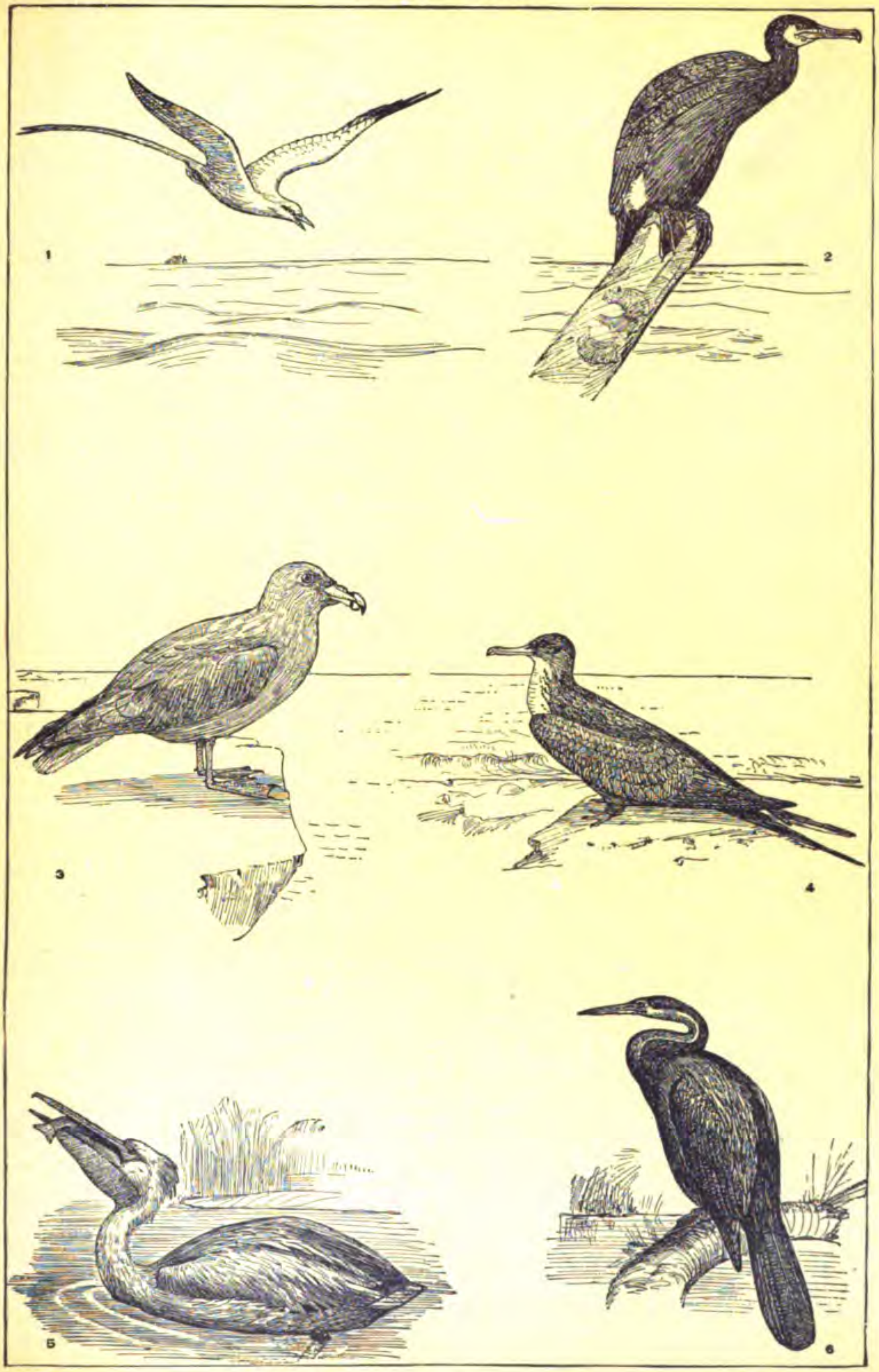
FISHING FROG. See Angler.

FISHING LAWS. Laws regulating the killing or taking of fish. These are divisible into two classes: those which are private, or municipal, in their character and sanction, and those which are international.

Private Fisheries. Some of the rules of municipal law governing fishing rights are fully stated in the article on game laws (q.v.). In Great Britain the right of fishing within the territorial seas and navigable streams belongs prima facie to all British subjects. If any person claims an exclusive right in such waters, the burden of proof is upon him to establish that right by royal or parliamentary grant or by prescription. In the United States the same presumption obtains in favor of public fishing in territorial seas and navigable waters, but it is the State and not the national government which ordinarily possesses the power of granting or regulating this right.

English law divides private rights of fishery into three principal classes: (1) common of fishery, or of piscary, (2) free fishery, and (3) several fishery. The first of these is not to be con-

FISHING BIRDS



1. **YELLOW-BILLED TROPIC BIRD** (Phaëthon americanus).
2. **CORMORANT** or **SHAG** (Phalacrocorax carbo).
3. **ARCTIC FULMAR** (Fulmarus glacialis).
4. **FRIGATE-BIRD** (Fregatus aquila).
5. **OLD-WORLD PELICAN** (Pelicanus onocrotalus).
6. **AFRICAN DARTER** (Plotus levaillanti).

founded with a common fishery, which designates the public right of all comers to take fish in public waters, but is a personal right created by municipal law, in the nature of a profit *à prendre*, to fish in particular waters in common with other persons. The second term is used in two senses. By some writers and judges it is defined as a franchise or exclusive privilege of fishing in a public river, while others make the term synonymous with several fishery. The latter designates the exclusive right which the owner of the soil beneath nonnavigable waters has to fish in those waters. It is a right of property which he may grant to another while reserving to himself ownership of the soil. When so conveyed to and held by another than the power of the soil, it is a profit *à prendre*. See PROFIT À PRENDRE.

A private right of fishery is held subject to the public use of navigable water as a highway and for the free passage of fish. It is also subordinate to regulations which may be prescribed by the state for the public good. Regulations of this character are now very numerous both in Great Britain and in the United States. They are intended primarily to prevent the unnecessary destruction of fish and to promote fish culture. They establish close seasons during which fish of certain varieties may not be caught, they regulate the manner of catching them, they prohibit the fouling of streams and ponds, and they annex severe penalties to violations of these provisions.

International Fisheries. International fishing laws are mostly regulated by treaty or convention, and the course of their development has largely depended upon the outcome of political disputes. This is especially true of the fishing laws fixed by treaty between the United States and Great Britain, and between Great Britain and France, in Newfoundland and North American waters. These played so important a part in the history of the three countries during the nineteenth century, and still present so many unsolved problems, that they demand careful consideration.

Between the United States and Great Britain the existing laws represent a working compromise, whose history runs back to 1783. In that year the Treaty of Paris, which acknowledged the independence of the United States, provided that American fishermen should continue to enjoy the right to fish in the waters of the British possessions in America, but forbade them to dry or cure fish on the coast of Newfoundland and in settled bays, harbors, and creeks of Nova Scotia, Magdalen Islands, and Labrador, unless by previous agreement with the inhabitants or possessors thereof. This arrangement continued in force until 1818, although, during the negotiations preceding the Treaty of Ghent of 1814, the views of the American and British commissioners clashed so decidedly on the interpretation of fishing rights under the Treaty of Paris that the question was ignored, as otherwise the Treaty of Ghent might not have been concluded. The superior value of the British-Canadian fisheries had attracted a considerable number of American fishermen, who had established themselves in the most advantageous places for curing and drying fish; and the British government, anticipating the effect of what they considered an undue advantage thus gained, held that the War of 1812 had abrogated the fishing rights fixed by the Treaty of Paris. By the Convention of London of 1818 the United States renounced for American fishermen the liberty of fishing, subject to certain exceptions, within 3 marine miles of any of the coasts, bays, creeks, or harbors of the British dominions in America, except the right of entering bays or harbors for purposes of shelter and for obtaining wood and water.

During the succeeding 36 years different constructions were put upon these provisions, and from time to time seizures of American fishing vessels were made for trespassing within the 3-mile limit. All these difficulties were, however, removed for a time by the Treaty of Washington (1854), better known as the Reciprocity Treaty, by which mutual restrictions as to sea fisheries, excepting shellfish, were done away with, and each country was granted full enjoyment of the sea-fishing grounds of the other. The termination of this treaty in 1866 by notice of the United States government placed the whole question back again in the position established by the Convention of London, in which it continued until the Treaty of Washington in 1871 restored the mutual fishing privileges of the Reciprocity Treaty. In the Treaty of 1871 provision was made for referring to arbitration the question of the greater value of Canadian fishing waters, and by the Halifax Commission of 1877 an award of $5,500,000 was made in favor of the Dominion of Canada. This treaty, which went into operation in 1873, was terminated in 1885 according to notice given by the United States government. The extent of the renunciation made by that government as expressed in the Convention of London was again thrown open to opposite interpretations, and, several American fishing vessels having been seized, Congress in 1887 passed a retaliatory law authorizing the President, at his discretion, to close American ports to Canadian vessels and merchandise. The discretion was never exercised. In 1888 another attempt to compose these differences was made by the Chamberlain-Bayard Treaty, which was rejected by the United States Senate; but a *modus vivendi* pending ratification was offered by the British commissioners, and an Act of the Dominion Parliament in 1890 enacted this temporary arrangement into law.

It is noteworthy that the termination of the Reciprocity Treaty of 1854 and of the Washington Treaty of 1871 was due in each case to the action of the United States government; and likewise the proposed Chamberlain-Bayard Treaty, which was acceptable to Great Britain and Canada, was rejected because it was believed wrongly to surrender incontestable American rights. Apart from certain political considerations which compelled American disapproval of these treaties, there were opposite interpretations which arose some years after the Treaty of Paris of 1783, and there were also additional interpretations of treaty rights advanced by the British North American colonies, before and after confederation in 1867. As regards the Treaty of Paris, the American claim, urged by the commissioners during the negotiation of the Treaty of Ghent and on subsequent notable occasions, was that the rights guaranteed by treaty in 1783 were not new, but the continuance of proprietary rights already existing and acknowledged. Not even the restriction as to the 3-mile limit, which is the especial feature of the Convention of London, is admitted by some American writers; but the terms of that convention are, nevertheless, accepted by both governments as the binding arrangement in default of a treaty superseding them. It has also been contended in behalf of the United States that, by a reciprocal arrangement entered into between that country and Great Britain in 1830, and by Article XXIX of the Treaty of Washington of 1871, American fishing vessels are entitled to the same commercial and transportation rights as other American vessels. Further, it is claimed that the so-called "headland doctrine," which presumes to fix the 3-mile limit by drawing a line from headland to headland instead of following the sinuosities of the coast, and by which American fishermen are prevented from entering Canadian bays and harbors to purchase supplies and tranship their catch, was not recognized by Great Britain but was an invention of the Canadian government. It was contended, also, that the stipulations of the Convention of London which allowed the entrance of American vessels into Canadian bays and harbors for repairs, shelter, wood, and water should be deemed privileges accorded on grounds of humanity and not as rights secured by treaty. The opposed contentions of Great Britain and Canada have been urged at various times by their commissioners in treaty negotiations and in the writings and speeches of public men. It is claimed that the American fishing rights guaranteed by the Treaty of Paris of 1783 were abrogated by the War of 1812 and were in consequence ignored by the Treaty of Ghent; that the American renunciation of the liberty of fishing within the 3-mile limit, as set forth in the Convention of London, is definite and final, that American fishing vessels were not within the meaning of the reciprocal arrangement of 1830; that the headland doctrine, and the restriction of the right of American fishing vessels in Canadian bays and harbors to the purposes only of obtaining shelter, repairs, wood, and water, is urgently necessary to protect Canadian fisheries.

Such are the main opposing views. The North Atlantic fisheries since 1885 have been regulated by the Convention of London. Reference has already been made to the temporary arrangement offered by the British Commission pending the ratification of the proposed Chamberlain-Bayard Treaty of 1888 and to the enactment of this arrangement into a Canadian law. An attempt to settle the fisheries question was made by the Joint High Commission, which met in Washington in 1899, but subsequently adjourned indefinitely without settling the various questions proposed.

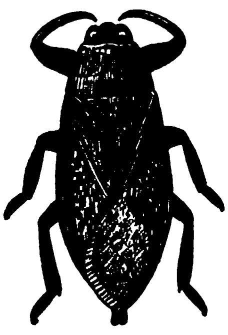
The fishing laws *as between Great Britain and France* in Newfoundland waters and the Gulf of St. Lawrence were fixed by the Treaty of Utrecht of 1713, the Treaty of Paris of 1763, the Treaty of Versailles of 1783, the Treaty of Paris of 1814, and the arrangement signed at Paris in 1885. By the first of these treaties Newfoundland was ceded to Great Britain, and the French were allowed to catch fish and dry them on land on that part only of the coast which stretches from Cape Bonavista to the northern part of the island and thence, running down by the western side, reaches as far as Point Riche. By Article V of the Treaty of Paris of 1763, which confirmed French rights on the coast, liberty was given to fish in the Gulf of St. Lawrence at a distance of 3 leagues from the coast, and on the Cape Breton coast at a distance of 15 leagues, the islands of Saint-Pierre and Miquelon being ceded to France as a shelter to her fishermen. In 1783 the Treaty of Versailles varied the French shore fishing limit, giving up a strip of coast from Cape Bonavista to Cape St. John, but extending the western coast limit to Cape Ray. The Treaty of Paris of 1814 confirmed these rights, and the arrangement of 1885 was entered into chiefly to calm the discontent of the British colonists of the islands, who were harassed on and ejected from the French shore. Article II of that arrangement permitted the formation of establishments on that coast shore for every other industry than fisheries, and stipulated not to disturb resident British subjects between Cape St. John and Cape Ray passing by the north.

The conditions produced by these French rights were seriously detrimental to the interests of the colony, and the Newfoundland Legislature refused to accept the settlements which had been proposed by various conventions. The opposing claims of the colonists and the French fishermen were clearly defined. The colonists contended that French rights under the Treaty of Utrecht did not forbid them to fish between Cape St. John and Cape Ray so long as they did not interrupt French fishing; that the French fishermen exceeded their rights in catching and canning lobsters; that colonial settlements and enterprises, other than fixed fishing establishments, were hindered, and also the working of mines; and that portions of the coast on which the French renounced their rights were worthless. The French fishermen contended, on the other hand, that their rights under the treaties were exclusive, and that all British fixed settlements between Cape St. John and Cape Ray were illegal.

By the Anglo-French *entente* of 1904 most of the questions at issue were definitely settled. France surrendered her pretensions to exclusive rights under the existing treaties, as also the right of French fishermen to cure fish on the coast of Newfoundland. In return for these concessions England paid France a money indemnity. The right to fish in common with British subjects, where this was formerly permitted, is retained by the French fishermen and continues to be a source of friction.

Consult: Paterson, *Fishery Laws* (London, 1878); Kent, *Commentaries on American Law;* Washburn, *The American Law of Real Property* (Boston, 1902); *New York Forest, Fish, and Game Law* (Albany, 1902); Doran, *Our Fishery Rights in the North Atlantic* (Philadelphia, 1888); Moore, *History and Law of Fisheries* (London, 1903). See GAME LAWS; FERÆ NATURÆ. For a discussion of the seal fisheries in Bering Sea, see BERING SEA CONTROVERSY.

FISH'KILL'ER. One of the great aquatic bugs of the heteropterous family Belostomatidæ, which prey upon fishes. They are the largest of existing bugs, some reaching a length of 4 inches, and have an oval outline, flat body, and a brownish or grayish hue. Their legs are flattened into powerful swimming organs, except the foremost pair, which are incurved and form organs for seizing and holding their victims, aided by hooks and processes on the inner surface of the tibiæ. The mouth parts include a strong beak for stabbing the prey, from which all the blood is sucked before it is let go. At the end of the abdomen are two narrow, flattened appendages, which are extensive but not concerned in respiration. The family is numerously represented in the rivers and ponds of northern Africa and southern Asia, but most extensively in America. The largest-known species is *Belostoma grandis* of the Amazonian region, where it lurks on the muddy bottoms of sluggish streams and bayous, ready to seize any salamander, fish, or other aquatic animal that it can overcome. The two most abundant and largest species in the United States are *Belostoma americana* and *Benacus griseus*, which much resemble one another in the brown-gray color and shape, but may be distinguished by the fact that the *Belostoma* "has a double groove on the underside of its fore thighs which is lacking on the thighs of *Benacus*." These bugs swarm about electric street lights in such numbers as to be known in many places, of late, as "electric-light bugs." They breed and develop wholly in the water, but their life history is not well known. The females of a related genus, *Zaitha*, have been found to have the curious habit of depositing and fastening their eggs upon the back of the males, who unwillingly carry them about until they hatch. The males fight hard against the infliction of this indignity, but are actually overcome by the females. Great damage may follow the introduction of these bugs into fish-cultural establishments. Consult Summers, "The True Bugs, or Heteroptera, of Tennessee," in *Tennessee Agricultural Experiment Station Bulletin*, vol. iv, No. 3 (Nashville, 1891).


FISHKILLER.

FISH'KILL LANDING. Formerly a village in Dutchess Co., N. Y., 59 miles north of New York City, on the east bank of the Hudson River, opposite Newburg, with which it is connected by a steam ferry, and on the Central New England and the New York, New Haven, and Hartford railroads (Map: New York, B 1). In May, 1913, it was joined with Matteawan village, forming the new city of Beacon, which was the first in the State to adopt the commission form of government. Its population as the village of Fishkill Landing, before the union with Matteawan, was, 1900, 3673; 1910, 3902. It has a picturesque location, contains a hospital, public library, and the Caswell Academy, and, as one of the oldest villages in the State, is replete with historical interest. There are several brick plants, and manufactories of hats, paints, tools, bakers' machinery, rubber and leather goods, carriages and sleighs, etc. Fishkill Landing was settled probably about 1695 and incorporated as a village in 1866. In 1776 the Provincial Convention of New York met here, and from 1776 to the close of the Revolution Fishkill was one of the principal military depots of the Northern army. At the Verplanck homestead, in the environs of the village, the Society of the Cincinnati was organized in 1783. Consult: Smith, *History of Dutchess County* (Pawling, N. Y., 1877); an article, "Fishkill in the Revolution," in the *Publications of the Historical Society of Newburg Bay*, for 1894; and Verplanck, "The Birthplace of the Order of the Cincinnati," in *New England Magazine*, vol. xiv, No. 5 (Boston, 1896).

FISH LOUSE, or SEA LOUSE. Any of various small crustaceans (copepods) which live parasitically on the outside or in the branchial chambers of marine animals, especially fishes and whales. All are of small size, and attached either temporarily or permanently to the hosts, on the juices of which they live, although many species have also the power of swimming freely in the water, some of their legs being adapted to this purpose. They are animals of singular form and appearance. In the genus *Argulus* there is a curious sucking disk on each side of the beak, or proboscis, although there are also jointed members terminated by prehensile hooks. In the genus *Caligus* the hooks of the anterior pairs of feet are the principal organs of adhesion to the slippery bodies of the fishes from which food is to be drawn, and the abdomen of the female is furnished with two remarkably long tubes, which contain a long series of flattened, coin-shaped eggs. The bodies of all of them are transparent, or nearly so. Consult United States Fish Commission *Annual Reports* (Washington, 1871 et seq.) for particulars as to the extensive list of species catalogued in American waters. See COPEPODA; also cut in article MENHADEN.

FISH MANURE. Dried and ground fish, or fish guano, is a valuable fertilizer obtained mainly from two sources: (1) the refuse from fish packing and canning establishments, and (2) the pomace from the extraction of oil from fish—in America, chiefly the menhaden. The product from the latter source is especially rich in fertilizing constituents, containing from 7 to 8 per cent of nitrogen and 6 to 8 per cent of phosphoric acid. The availability of the nitrogen is nearly as great as that of dried blood and tankage. The phosphoric acid is frequently more available than that in other organic matter. The availability of the fertilizing constituents depends largely upon the proportion of oil present. A considerable proportion of the latter delays decomposition in the soil and thus reduces the availability. The oil is removed and the fish prepared for use as a fertilizer on a commercial scale by cooking with steam and pressing. The pressed residue is dried and ground. In some cases, after the first pressing, the material is subjected to the action of steam under pressure and sulphuric acid (5 per cent) to render the fertilizing constituents more available. The uncooked fish is sometimes treated directly with sulphuric acid to prevent offensive decomposition and to increase the availability of the nitrogen and phosphoric acid.

Fish manures are prepared and used in considerable quantities, especially along the northeastern coast of America, in Norway, and other regions where the supply of material is abundant. Their preparation has greatly increased in recent years on the northwest coast of the United States and in Alaska, largely for export to Hawaii and Japan. Fish manure is exported in considerable quantities from Norway. There is still, however, enormous waste of fish by-products which might be profitably utilized as fertilizers.

In localities where it can be readily obtained from fishermen, fish scrap is frequently used without preparation of any kind. Naturally this product is very variable in composition, the nitrogen ranging from 2.5 to 8 per cent and the phosphoric acid from 2 to 6 per cent. The fertilizing constituents of this material are less available than those of the dried and finely ground fish. The whole fish are also sometimes used as a manure, either directly or composted with other materials. It is stated in Bradford, *History of Plymouth Plantation* (Boston, 1856), that the Indian Squanto first taught the New England colonists to use the menhaden as a fertilizer for corn, instructing them to put the fish under the hills at the time of planting. (See also Manures and Manuring.) Consult: Goode, "The Natural and Economic History of the American Menhaden," *United States Fish Commission Report* (1877); Stevenson, "Aquatic Products in Arts and Industries," *United States Fish Commission Report*, p. 177 (1902); Voorhees, *Fertilizers* (New York, 1902); Aikman, *Manures and the Principles of Manuring* (Edinburgh, 1894); Storer, *Agriculture* (7th ed., New York, 1897); Turrentine, "The Fish-Scrap Fertilizer Industry of the Atlantic Coast," *United States Department of Agriculture, Bulletin 2; American Fertilizer Handbook* (Philadelphia, 1913).

FISH OF PARADISE. An East Indian fish (*Macropodus viridiauratus*), related to the gouramis and noted for its extended fins and brilliant colors. It is cultivated for ornamental aquariums.

FISH OWL. See Ketupa.

FISHPLATE. See Railways.

FISH SKIN DISEASE. See Ichthyosis.

FISHTAIL PALM. See Caryota.

FISK, Clinton Bowen (1828–90). An American soldier and philanthropist. He was born at Greigsville, N. Y., spent some years as a merchant in Michigan, and then removed to St. Louis, Mo. At the beginning of the Civil War he entered the Union army and in 1865 was brevetted major general. Subsequently he devoted his life largely to the interests of the negro race, was assistant commissioner in the Freedmen's Bureau, and was instrumental in founding Fisk University. In 1884 he left the Republican party and identified himself with the temperance movement. He was Prohibition candidate for Governor of New Jersey in 1886 and for President of the United States in 1888. Consult the *Life* by A. A. Hopkins (New York, 1888).

FISK, Fidelia (1816–64). An American missionary. She was born in Shelburne, Mass., graduated from Mount Holyoke, was a missionary of the American Board among the Nestorians in 1843–58, and became first principal of the seminary for women at Urumiah. She wrote *Recollections of Mary Lyon* (1866). Consult D. T. Fiske, *A Memoir of Fidelia Fisk: Faith Working by Love* (Boston, 1869).

FISK, James, Jr. (1834–72). An American stock manipulator and financial buccaneer. He was born in Bennington, Vt., the son of a peddler, and received scanty schooling. After trying various other occupations, he took up that of his father and finally attracted the attention of Jordan and Marsh, the Boston merchants of whom he bought his wares, and as a member of that firm enriched them and himself by shrewd bargaining with the government and, it was said, by smuggling cotton through the lines during the Civil War. Four years later he opened a brokerage office in New York City. He picked up a precarious living for some time, until Daniel Drew set him up in business with a man named Belden, using them as his agents in his famous struggle with Cornelius Vanderbilt for the control of the Erie Railway. As a result of a compromise, the Drew-Fisk interest combined with the Eldridge-Gould interest, forced the Vanderbilt faction out of the directorate, installing Fisk and Jay Gould in their stead. This marked the beginning of the notorious association of Jay Gould and James Fisk, which terminated only with the death of Fisk. Gould became president of the Erie Railroad, and Fisk the vice president and comptroller. From their headquarters a campaign of bribery and corruption was carried on that brought under the power of these men city, State, and Federal officials, judges and legislatures, reaching its climax in the gold conspiracy of 1869 and "Black Friday," when an attempt was made to control President Grant himself. In a quarrel with one of his former partners, E. S. Stokes, three years later, Fisk was shot and killed. Consult Adams, *Chapters of Erie, and Other Essays* (New York, 1886), and Black, *Essays* (ib., 1890).

FISK, Pliny (1792–1825). An American Congregational missionary, born in Shelburne, Mass. He graduated at Middlebury College, Vermont, in 1814 and at Andover Seminary in 1818. After being agent of the American Board of Commissioners for Foreign Missions he went to Palestine in 1819 and in 1825 became a member of the successful mission in Beirut. After his death was published an English-Arabic Dictionary which he finished the day he died. Consult Bond, *Life of Pliny Fisk* (Boston, 1828).

FISK, Wilbur (1792–1839). An American educator and clergyman. He was born at Brattleboro, Vt., graduated at Brown University, and afterward studied law, but in 1818 entered the Methodist ministry. With others, he founded an academy at Wilbraham, Mass., of which, in 1825, he became the first principal. He also aided in the founding of Wesleyan University, at Middletown, Conn., and became its first president in 1831. He had previously refused the presidency of La Grange College (Alabama), and in 1836 declined an election as Bishop in the Methodist Episcopal church. Among his works are: *The Science of Education* (1832); *The Calvinistic Controversy* (1837); *Travels in Europe* (1838). Consult Joseph Holdich's biography in *American Religious Leaders Series* (New York, 1842), and George Prentice in *Life and Writings of Wilbur Fisk* (Boston, 1890).

FISKE, Amos Kidder (1842–1921). An American journalist and author, born at Whitefield, N. H. He graduated at Harvard in 1866, was admitted to the New York bar in 1868, assisted G. T. Curtis (q.v.) in the preparation of the latter's *Life of Daniel Webster* (2 vols., 1870), contributed to the revised edition of the *American Cyclopædia* of Ripley and Dana (1873–76), and for 22 years was connected with the editorial staff of the New York *Times*. In 1900–02 he was a member of the staff of the New York *Mail and Express*, and in 1903 he became associate editor of the New York *Journal of Commerce and Commercial Bulletin*. His publications include: *Midnight Talks at the Club* (1890); *Beyond the Bourn* (1891); *The Jewish Scriptures* (1896); *The Myths of Israel* (1897); *The Story of the Philippines* (1898); *The West Indies* (in the "Story of the Nations

Series," 1899); *The Modern Bank* (1904); *The Great Epic of Israel* (1911).

FISKE, Bradley Allen (1854–). An American naval officer and inventor. He was born at Lyons, N. Y., and graduated from the United States Naval Academy in 1874. Rising through the various grades, he became captain in 1907 and rear admiral in 1911. At the battle of Manila Bay he was navigator of the *Petrel* and during the Filipino insurrection, while navigator of the *Monadnock* and executive officer of the *Yorktown*, he participated in several bombardments. He was in command, at various times, of the *Minneapolis*, the *Arkansas*, the *Tennessee*, and the fifth division of the Atlantic fleet, and in 1911–12 was president of the Naval Institute. His inventions include a large number and variety of electric devices for warships. His naval telescope sight resulted in greatly improving the accuracy of naval gunnery. He was awarded the Elliott Cresson gold medal by the Franklin Institute (1893) and a gold medal by the United States Naval Institute (1905) for the prize essay "American Naval Policy." Besides special articles, he is author of *Electricity in Theory and Practice* (1883) and *War Time in Manila* (1913).

FISKE, Daniel Willard (1831–1904). An American scholar, born in Ellisburg, Jefferson Co., N. Y. He was educated at Hamilton College, but left before graduating to go abroad and devote his time to a study of the Scandinavian language and literature. He spent the years 1849–52 at the University of Upsala, supporting himself by teaching English and lecturing on American literature. From 1852 to 1859 he was an assistant in the Astor Library, New York City, and devoted much of his attention to gathering its Scandinavian collection. He edited the *American Chess Monthly* (1857–60) and published *The Book of the American Chess Congress* (1859). In 1861–62 he was an attaché of the American Legation at Vienna, under John Lothrop Motley. He was editor of the Syracuse (N. Y.) *Daily Journal* in 1864–66, and of the Hartford (Conn.) *Courant* in 1867–68. In the latter year he was elected professor of North European languages and librarian at Cornell University. In 1881 he resigned, and removed to Florence, Italy. He presented to Cornell a very valuable Dante collection, for the catalogue of which he wrote a noteworthy introduction. His posthumous publications include: *Bibliographical Notices* (6 vols., 1886–1907); *Chess in Iceland and in Icelandic Literature* (1905); *Chess Tales and Chess Miscellanies* (1912).

FISKE, Harrison Grey (1861–). An American theatrical manager and journalist. He was born at Harrison, N. Y., was educated at New York University, and early served as an editorial writer and dramatic critic for the Jersey City *Argus* and later for the New York *Star*. In 1879 he became a contributor to the New York *Dramatic Mirror*, of which, until 1911, he was editor (and after 1883 proprietor). He was also manager for the Manhattan Company and for his wife, Minnie Maddern Fiske, and other stars. He wrote the plays *Hester Crewe, The Privateer*, and *A White Pink*.

FISKE, John (1842–1901). An American philosopher and historian. His original name was Edmund Fiske Green, but on the second marriage of his mother (1855) he assumed the name of his maternal great-grandfather, John Fiske. He was born at Hartford, Conn., March 30, 1842. As a child, he exhibited remarkable precocity. He was graduated at Harvard College in 1863 and at the Harvard Law School in 1865; but he never practiced law, having already, in 1861, inaugurated his literary career by an article on Mr. Buckle's fallacies, in the *National Quarterly Review*. In 1869 he began a career of distinguished success as a lecturer at Harvard, his general subject being "Philosophy in its Evolutionary Aspect." In 1870 he was made instructor in history there, and in 1872 assistant librarian, a post which he resigned in 1879. In 1884 he was made professor of American history in Washington University, St. Louis, having held a lectureship there since 1881, and lectured annually for some years, though continuing to reside in Cambridge. His reputation was already international, for he had lectured on American history at University College, London, in 1879, and at the Royal Institution of Great Britain in 1880. During the earlier part of his career his interest was very largely absorbed by the study of evolution, and it was as a popularizer of its philosophy that he first won a national reputation, through *Outlines of Cosmic Philosophy* (1874). Essays and studies on allied subjects appeared under the titles: *Myths and Myth Makers* (1872); *The Unseen World* (1876); *Darwinism and Other Essays* (1879; revised and enlarged, 1885); *Excursions of an Evolutionist* (1883); *The Destiny of Man Viewed in the Light of his Origin* (1884); *The Idea of God as Affected by Modern Knowledge* (1885). This last work, supplemented by his *Origin of Evil* (1899), may be regarded as a final epitome of his religious and philosophic views. In addition to the volumes named may be mentioned: *A Century of Science and Other Essays* (1899); *Through Nature to God* (1899); *Life Everlasting* (1901). *American Political Ideas Viewed from the Standpoint of Universal History* was published in 1885, and with this began the 15 years devoted to investigations in American history, which must be regarded as at once the most popular and the most valuable of his contributions to American literature and to the molding of the national life. His contributions in book form to the history of his country were: *The Critical Period of American History, 1783–89* (1888); *The Beginnings of New England* (1889); *The War of Independence*, a book for young people (1889); *Civil Government of the United States* (1890); *The American Revolution* (2 vols., 1891); *The Discovery of America* (2 vols., 1892); *A United States History for Schools* (1895); *Old Virginia and her Neighbors* (2 vols., 1897); *Dutch and Quaker Colonies in America* (2 vols., 1899); *Essays, Literary and Historical* (1902); *New France and New England* (1902). In 1912 the *Historical Works* (Popular Edition) appeared, a collection of Fiske's historical writings in 11 vols. These various works may be said to constitute practically a connected history of the United States from the first discoveries to the establishment of federal government. In 1900 appeared *The Mississippi Valley in the Civil War*. In addition, he edited, with Gen. James Grant Wilson, *Appleton's Cyclopædia of American Biography* (1887). He is to be esteemed not less as an educative force than as an investigator. More than any other writer of his generation he brought home to the national consciousness a philosophic view of American history, by his remarkable power for lucid statement of balanced judgments. To his zeal of acquisition was joined an equal zeal to impart, and his admirable style made the work of following him anything but labor. He died, worn out by overwork, at Gloucester, Mass., July 4, 1901. Consult Perry, *John Fiske* (Boston, 1906).

FISKE, Lewis Ransom (1825–1901). An American Methodist Episcopal clergyman, born in Penfield, N. Y. He graduated from the University of Michigan in 1850. Entering the ministry in 1857, he served several important churches, and was president of Albion College from 1877 to 1897. He was president of the Association of College Presidents of the Methodist Episcopal church, a member of six general conferences and of the ecumenical conference of 1891, and in 1889 president of the Michigan Teachers' Association. His baccalaureate sermons were published in 1898.

FISKE, Minnie Maddern (1865–). A prominent American actress, born in New Orleans, of theatrical parents, her father, Thomas Davey, being a manager. Maddern was her mother's family name. From infancy her life was largely spent in the theatre, and at three years she made her regular appearance upon the stage. Throughout her childhood she played at times with many well-known actors, including Laura Keene, John McCullough, and, later, Barry Sullivan and E. L. Davenport. Occasionally she even took old women's parts and at 13 appeared as the Widow Melnotte with great success. When 16 years old Miss Maddern was brought out as a star (May, 1882, in *Fogg's Ferry*), and thus for several years she won some success; but her rôles were not, on the whole, well suited to her. In March, 1890, she was married to Harrison Grey Fiske and retired for over three years of rest and study. In the fall of 1893 she reappeared in New York in her husband's *Hester Crewe;* she played also the part of Nora in Ibsen's *A Doll's House* and later for some time resumed her Western tours. In 1897 she made a sensation in *Tess of the D'Urbervilles.* Afterward she appeared in *A Bit of Old Chelsea, Little Italy, Frou Frou, Magda,* and other plays, of which her *Becky Sharp* (1899) is considered her greatest achievement. In the season of 1901–02 she opened the Manhattan Theatre as an independent New York playhouse, where she produced *The Unwelcome Mrs. Hatch* and in 1904 *Leah Kleschna.* From 1907 to 1910 she brought out Ibsen's *Rosmersholm* and *The Pillars of Society* and Hauptmann's *Hanneles Himmelfahrt,* appearing in the leading parts. Mrs. Fiske is an actress of strong intelligence and no little power of dramatic realism, with an insistent quality which is capable of great effect in passages of sustained emotion. She is the author of several plays and collaborated with her husband in *Fontenelle.* Consult: Strang, *Famous Actresses of the Day in America* (Boston, 1899); McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896); Hapgood, *The Stage in America, 1897–1900* (ib., 1901); Winter, *The Wallet of Time* (2 vols., ib., 1913).

FISKE, Stephen (1840–1916). An American journalist and dramatic critic, born at New Brunswick, N. J. He was educated at Rutgers College and served on the New York *Herald* in various capacities—as correspondent during part of the Civil War and on the Prince of Wales's (Edward VII's) tour of the United States, as editorial writer, and as dramatic critic. For a time he managed the St. James's Theatre and the Royal Opera, London, and the Fifth Avenue Theatre, New York, and it was he who first introduced Modjeska and Mary Anderson. He was later appointed dramatic critic of the *Spirit of the Times,* New York City. His writings comprise several plays, including an adaptation of Dickens's *Martin Chuzzlewit, Holiday Tales,* and two collections of sketches, *English Photographs* and *Offhand Portraits of Prominent New Yorkers* (1884), the latter containing much interesting material originally published in the *Knickerbocker Magazine.*

FISKE, Thomas Scott (1865–). An American mathematician. He was born in New York City and graduated in 1885 (Ph.D., 1888) from Columbia University, where he was fellow, assistant, tutor, instructor, and adjunct professor until 1897, when he became professor of mathematics. In 1899 he was acting dean of Barnard College. He was president in 1902–04 of the American Mathematical Society, and he also edited the *Bulletin* (1891–99) and *Transactions* (1899–1905) of this society. In 1902 he became secretary of the College Entrance Examination Board. In 1905–06 he also served as president of the Association of Teachers of Mathematics of the Middle States and Maryland. Besides his mathematical papers, he is author of *Theory of Functions of a Complex Variable* (1906; 4th ed., 1907).

FISK UNIVERSITY. An institution for the education of colored persons, founded in 1866, at Nashville, Tenn., by the American Missionary Association of New York and the Western Freedmen's Aid Commission of Cincinnati. The university early became well known through the efforts made on its behalf by Gen. Clinton B. Fisk, from whom the institution took its name, and from the "jubilee singers," composed of its students, who toured the United States and Great Britain, raising $150,000 for the institution's needs. The university at present comprises normal, college, preparatory, music, and industrial departments. The attendance in all departments in 1913 was 514, of whom 206 were in the collegiate department. The total value of the university property was about $350,000, and the annual income from endowment and tuitions about $6000. It has had three presidents, E. M. Cravath, D.D., J. G. Merrill, D.D., and G. A. Gates, D.D., LL.D. C. W. Morrow, D.D., was in 1914 the dean and acting president.

FISSION, fish'ŭn (Lat. *fissio,* from *findere,* to split; connected with Skt. *bhid,* to split, Goth. *beitan,* OHG. *bizzan,* Ger. *beissen,* AS. *bītan,* Eng. *bite*). In plants, a term which has been applied to cell division in general, but which is now becoming restricted to cell division in the bacteria and blue-green algæ (Cyanophyceæ) and to the splitting of chromosomes. (See Cell, in plants.) In animals of lowest organization, the process of reproduction by "budding" or cell division.

FISSION FUNGI. See Schizomycetes.

FISSIPEDIA. See Carnivora.

FIS'TULA (Lat., pipe). A term formerly applied to such an abscess (q.v.) as had contracted to narrow, hard, open passages in the soft tissues of the body, lined by a kind of false membrane, giving rise to a thin discharge. At the present time the term "fistula" is generally limited to the opening of such a passage when in close contact with a mucous membrane, the word "sinus" being used in the former sense. Thus, it is common to speak of salivary fistulæ, urinary fistulæ, etc.; and the most common and troublesome kind of all is the *fistula in ano*, in connection with the lower bowel or rectum. It consists essentially of an unhealed abscess, discharging by two openings—one in the mucous membrane, the other in the skin. When only one opening exists, the fistula is known as a blind one. The only efficient treatment is surgical and consists in laying open the tissues to the bottom of the cavity.

Fistulous openings may form between the bladder, the urethra, the rectum, the ureter, and the vagina. The latter, vesicovaginal fistula, is most common, and is usually the result of injuries sustained in difficult labors. Leakage of urine occurs with the distressing accompaniments of inflammation, sloughing, and sometimes secondary infection of the kidneys. The condition is curable by a plastic operation. J. Marion Sims, an American surgeon, was the first to perform the operation in the United States.

In farriery, the name is given to a pus-discharging abscess usually situated on the withers of a horse. When it appears on the head, it is called poll evil. Such abscesses are usually due to chafing halter, harness, or saddle, or to blows. Horses with high withers, or saddle horses with low withers upon which the saddle rides far forward, are especially liable to this affection. The most satisfactory treatment is to open the abscess at its lowest point, so as to allow for drainage, and to wash out with antiseptic solutions.

FIS'TULI'NA. See Fungi, Edible and Poisonous.

FIT (AS. *fitt*, struggle, of unknown etymology). A name popularly applied to a convulsion (q.v.), or, indeed, to any sudden seizure of disease implying loss of consciousness. (See Hysteria; Epilepsy.) The term is also used colloquially to designate a mood or a temporary change in mental attitude, without disease, as denoted by such expressions as "a fit of the blues," "a fit of abstraction," "an economical fit," etc.

FITCH, or **FITCHEW**, fĭch'û (from ODutch *vitsche*, *visse*, *fisse*, polecat). The European polecat (q.v.).

FITCH, Clyde. See Fitch, William Clyde.

FITCH, Ebenezer (1756–1833). An American educator, born in Norwich, Conn. He graduated at Yale in 1777 and in 1780–83 and 1786–91 was tutor there. In 1791 he became principal of the school at Williamstown, Mass., and when it became Williams College in 1793 he was elected its first president. This position he resigned in 1815, to become pastor of the Presbyterian Church at Bloomfield, N. Y. He retired to private life in 1827. He was the author of a *Latin Grammar* (1814).

FITCH, Graham Newell (1809–92). An American legislator, born in Le Roy, N. Y. He studied medicine, and removed to Logansport, Ind., in 1834. From 1844 to 1849 he was a professor in Rush Medical College, Chicago, and from 1878 to 1883 in the Indiana Medical College. From 1836 to 1839 he was a member of the State Legislature and from 1849 to 1853 was in Congress. In 1857 he was elected to the United States Senate and served until 1861. In the fall of that year he was commissioned colonel of the Forty-sixth Indiana Volunteer Infantry, which he had himself raised. Late in 1862 he was compelled to resign, as a result of wounds received in action.

FITCH, John (1743–98). A distinguished American inventor, who was one of the first to apply steam to the propulsion of boats. He was born at Windsor, Conn., and was the son of a farmer. After receiving a common-school education he made a few voyages before the mast, and at the time of the Revolution he became a sutler with the American army and amassed extensive profits, which he invested in Virginia. In 1780 Fitch became deputy surveyor of Kentucky and a year later, while traveling, was captured by the Indians, but soon released. He next devoted himself to the production of a map of the Northwestern country, and the idea of employing steam in the navigation of the Western rivers, on which he sailed, having occurred to him, he sought by the sale of this map to obtain the means for his experiments. Unsuccessful in this, he next sought help from the State legislatures, but failed to obtain an appropriation. He at last succeeded in forming a company and, with the assistance thus obtained, constructed a steam packet, which was launched on the Delaware in 1787 and reached a speed of 3 miles an hour. This boat was fitted with paddles at the sides, which were moved forward and back in a manner similar to that followed in propelling a canoe. A second boat had similar paddles at the stern. Fitch had obtained exclusive rights of steam navigation in New Jersey, Pennsylvania, and Delaware, and in 1790 built a boat to convey passengers on the Delaware River for hire. The scheme proved unfortunate, and the company which sustained him was dissolved. In 1793 he went to France, with the hope of introducing his invention, but failed, and returned to America disheartened and impoverished. In 1796 he constructed a small screw steamboat, with which he experimented on the "Collect" Pond in New York City. In the meantime his Virginia lands had fallen a prey to "squatters," and, heartbroken by his failures and disappointments, he committed suicide. Consult Westcott, *Life of John Fitch* (1857), and, for a brief account of his work, Thurston, *Growth of the Steam Engine* (New York, 1878).

FITCH, Sir Joshua Girling (1824–1903). An English educator, born in London. Graduating from the University of London in 1850 (M.A., 1852), he joined the staff of the Borough Road Training College, of which in 1856 he became principal. In 1863 he was appointed inspector of schools, in 1883 he became chief inspector for the eastern division, and from 1885 to 1894 he was chief inspector of training colleges for women in England and Wales. He was also assistant commissioner for the schools inquiry commission in 1865–67 and for the endowed schools in 1870–77. He was knighted in 1896. His publications include: *Lectures on Teaching* (1881); *Thomas and Matthew Arnold, and their Influence on English Education* (1897); *Educational Aims and Methods* (1900).

FITCH, Leroy (1835–75). An American naval officer, born in Indiana. He graduated in 1856 at the United States Naval Academy, served during the Civil War in the Mississippi squadron, and rose in 1870 to be commander. He participated in the capture of Fort Donelson and Fort Pillow, and in 1863, while commanding the *Moose*, he prevented Morgan's attempted crossing of the Ohio River and captured the wagon train and part of the artillery of that leader. Subsequently he directed the defense of Johnsonville, Tenn., against Gen. N. B. Forrest.

FITCH, Ralph. An English merchant and traveler of the sixteenth century. Nothing is known of his birth or early life. In 1583, with John Newberry and two other Englishmen in the service of the Levant Company, he set out on a commercial journey to the Far East, his object being mainly to return with a supply of Eastern spices and other commodities. The party traveled from Aleppo, in Syria, down the valley of the Euphrates to Basra, at the head of the Persian Gulf, being the first Englishmen known to have made the overland trip. Continuing their journey to Ormuz, they were there imprisoned by the Portuguese Governor. From Ormuz they were conveyed as prisoners to Goa. After some months spent in captivity, the prisoners were released, and Fitch and two companions started overland across India. The party intended traveling as far as China, but it is believed that Portuguese trade rivalry prevented them from attaining their goal. Fitch ultimately parted company with his companions, and, after spending some time in the valley of the Ganges, took ship to Pegu, near Rangoon, in Burma, which country he was the first Englishman to visit. From Pegu he traveled through Siam and visited Malacca and Singapore, returning thence to Pegu, Bengal, and, by way of the Malabar coast, to Goa, whence he returned to Europe by the same route over which he had come, and arrived in England in 1591, after an absence of eight years. He continued in mercantile business and was probably one of the promoters of the East India Company. His account of his journey has been printed in Hakluyt's *Voyages* and in Pinkerton's *Collections of Travels* (London, 1812–14).

FITCH, (William) Clyde (1865–1909). An American playwright, born in New York and educated at Amherst College, where he graduated in 1886. His first play, *Beau Brummel*, was brought out by Richard Mansfield in 1890. This was followed by several adaptations from the French and German and a large number of original pieces. He quickly sprang into prominence and was the first American dramatist whose name was sufficiently well known to attract people to the theatre. His work often suffered from carelessness and haste, but it has about it an unmistakable mark of distinction. His best-known plays are: *Nathan Hale* (1898); *Barbara Frietchie* (1899); *The Climbers* (1905); *The Stubbornness of Geraldine* (1902); *The Girl with the Green Eyes* (1902); *Her Own Way* (1903); *The Woman in the Case* (1904); *The Truth* (1906); *The Straight Road* (1906); *The City* (1909). The last was unfinished when his sudden death occurred in 1909, but was produced in the form in which he left it. Consult Montrose J. Moses, *The American Dramatist* (Boston, 1911), and William Winter, *The Wallet of Time* (2 vols., New York, 1913).

FITCH′BURG. A manufacturing city (including the villages of West Fitchburg, South Fitchburg, and Cleghorn) and one of the county seats of Worcester Co., Mass., 42 miles by rail north of Worcester and 50 miles west-northwest of Boston, on a branch of the Nashua River and on the Boston and Maine and the New York, New Haven, and Hartford railroads (Map: Massachusetts, D 2). It is the seat of the Fitchburg State Normal School and has a public library, large musical library, Burbank Hospital, three parks, an old ladies' home, a home for working women, and a children's home. Fitchburg has extensive manufactures of textiles, firearms, saws, screen plates, and steel horse collars. In 1912 the value of its products exceeded $32,000,000. Other of its industrial interests include granite quarries, brickyards, and manufactures of axle grease, boilers, lining metals, castings, turned-wood novelties, pumps, cotton yarns and woolens, ginghams, cars, bicycles, steam engines, electrical appliances, paper, machinery, tools, etc. Fitchburg was settled in 1719, but formed a part of Lunenburg until 1764, when it was incorporated. It was chartered as a city in 1872. The government is administered, under the original city charter, by an annually elected mayor. Fitchburg owns its water works. Pop., 1900, 31,531; 1910, 37,826; 1914 (U. S. est.), 40,507; 1920, 41,013. Consult Torrey, *History of the Town of Fitchburg* (Fitchburg, 1865), and *History of Worcester County* (Philadelphia, 1889).

FITCHY, or **FITCHEE** (from Fr. *fiché*, p.p. of *ficher*, to drive in, It. *ficcare*, to fix, from Lat. *figere*, to fix, to fasten). A term in heraldry signifying "pointed" and usually applied to a cross the lower arm of which has been sharpened so that it may be fixed in the ground. This form is derived from the crosses carried by pilgrims as walking sticks. See Heraldry.

FITGER, fit′gẽr, Arthur Heinrich Wilhelm (1840–1909). A German poet and historical painter, born at Delmenhorst (Oldenburg). He was a pupil of Cornelius and Genelli at the Munich Academy; later he studied at Antwerp, Paris, and Rome, and in 1869 established his studio in Bremen. As a painter, he is known for his large decorative works. The *motif* of these is derived mostly from the legendary or the purely fantastic, and elaborated with a wealth of coloring acquired from Rubens and the Venetians. They include a frieze (in monochrome), representing the development of German civilization, for the Rutenhof, Bremen; the frieze for the gallery of the Bourse and decorations for the Ratskeller, both at Bremen; 14 pictures for the banquet hall of the ducal residence at Altenstein, Saxe-Meiningen; "The Four Elements" for the Kunsthalle of Hamburg; the decorations for the salle des fêtes of the Bremen Künstlerhaus; and paintings for the Hamburg Town Hall and for the North German Lloyd steamer *Kaiser Wilhelm I*. His publications include: *Adalbert von Bremen*, a tragedy (1873); *Die Hexe* (1875), a philosophical drama, marked by dignity of expression and rather skillful character drawing; *Von Gottes Gnaden* (1883), more a bloody play than a tragedy; *Fahrendes Volk* (1875; 4th ed., 1894), and *Winternächte* (1885), volumes of poems. He also rendered into German (1886) Byron's *Marino Faliero*, and for the *Denkmale der Geschichte und Kunst Bremens* (1877) prepared a history of the local cathedral.

FITTIG, fit′ĭk, Rudolf (1835–1910). A German chemist, born at Hamburg. He studied chemistry at Göttingen and became assistant to Wöhler, the celebrated organic chemist, in 1858. From 1860 to 1870 he taught at Göttingen, in the latter year was appointed full professor of chemistry at Tübingen, and in 1876 was made professor at Strassburg. His literary activity consisted mainly in his reëditing Wöhler's work on organic chemistry. On the other hand, his name is connected with a number of original contributions, which have formed an integral part of the science of organic chemistry. He discovered the interesting class of substances termed *lactones* (anhydrides formed from compounds which are at once acids and alcohols, just as *esters* are formed by the action of acids on alcohols). Furthermore, he effected the synthesis of a number of interesting compounds of carbon and hydrogen and discovered phenanthrene and other important substances in coal tar.

FITTING, fĭt'ĭng, HEINRICH HERMANN (1831–). A German jurist. He was born at Mauchenheim and studied at Würzburg, Heidelberg, and Erlangen. In 1857 he was appointed professor of Roman law at Basel, and in 1862 he was called in the same capacity to Halle. He retired to private life in 1902. From 1864 to 1878 he was engaged in publishing the *Archiv für die civilistische Praxis*. He wrote: *Der Reichscivilprozess* (7th ed., 1890); *Das Reichskonkursrecht und Konkursverfahren* (new ed., 1904); *Die Anfänge der Rechtsschule zu Bologna* (1888).

FITWEED. See ERYNGO.

FITZ (AS. *fiz*, OF. *fis*, *fils*, Fr. *fils*, from Lat. *filius*, son). An old Norman word signifying "son." Like the Scottish *Mac*, the Irish *O'*, and the Oriental *Ben*, it is prefixed to proper names to signify descent, as in the Norman names Fitzwilliam, Fitzwalter, Fitzgerald. A later application of it has been to denote the natural sons of royalty, as in Fitzroy, Fitzjames, and Fitzclarence.

FITZ, REGINALD HEBER (1843–1913). An American physician, born at Chelsea, Mass. He graduated in 1864 (M.D., 1868) from Harvard University, where, after studying in Vienna, Berlin, and Paris, he was instructor in pathological anatomy in 1870–73, assistant professor in 1873–78, and professor from 1878 to 1908. In the latter year he became professor emeritus. He also served as physician to the Boston Dispensary in 1871–82 and to the Massachusetts General Hospital from 1887 to 1908. In 1894 he was president of the Association of American Physicians. Besides his contributions to medical journals, he is joint author with Horatio C. Wood of *The Practice of Medicine* (1897).

FITZAL'AN, HENRY, twelfth EARL OF ARUNDEL (c.1511–80). An English statesman, son of William and Anne Percy. He was a godson of Henry VIII and early entered his service. For his part in the storming of Boulogne (1544) he was rewarded with the office of Lord Chamberlain, in which position he was retained by Edward VI. But Warwick was jealous of Arundel's influence over the King and removed him from the council in 1550 on charges which were never proved. In 1551, when Somerset was for a second time sent to the Tower, Arundel seemed to be implicated, but he was pardoned, without trial, on signing a confession and paying a heavy fine. Arundel feigned acquiescence in Northumberland's plan to bring Lady Jane Grey to the throne, but worked for Mary. He kept in favor with her while she was Queen and was made her Lord Steward; and he dared to remonstrate with her on her treatment of Elizabeth. When Elizabeth was crowned, Arundel was Lord High Constable and was kept in office, but quarreled with her in 1562 after she had reproached him for planning for the succession (he worked for Lady Catharine Grey) during her illness, and two years later he resigned his post as Lord Steward. Received again into the Queen's favor, he began to plot in behalf of Mary Stuart and tried to bring about her marriage with Norfolk, which he trusted would result in the overthrow of Elizabeth. On the discovery of the plot he was kept under guard during the Northern Insurrection; but he had not committed himself in the rebellion and in 1570 was recalled to the council. A year later, when it was proved that he had long been plotting sedition, he was arrested and kept under guard until the end of 1572. The last years of his life were passed in quiet retirement. Consult the "Life," apparently by his chaplain, edited with notes by Nichols in the *Gentleman's Magazine* for 1833.

FITZALAN, RICHARD, EARL OF ARUNDEL AND WARENNE (c.1307–76). An English soldier and admiral of Edward III, second Richard of the house, son of Edmund and Alice Warenne. He did not come into the title until 1331, after the death of Mortimer. In 1337 he was made joint commander against Scotland, after the failure to capture Dunbar was put in sole command, completed a truce with the Scotch, and followed Edward III to Brabant. Parliament made him admiral in 1340. He fought at Sluis, was a commissioner to Parliament in 1341, and took part in the siege of Tournai. In 1344 he was one of the lieutenants of Aquitaine and in 1345 put away his wife, Isabella le Despenser, and married Eleanor, widow of Lord Beaumont and daughter of Henry of Lancaster. He commanded one of the three divisions at Crécy and was in the siege of Calais. He treated with the Pope and, after taking part in the battle of Winchelsea (1350), was employed on diplomatic service in Scotland, Luxemburg, and France. He was regent of England in 1355. In 1365 he was summoned before the Pope by William de Lenne, Bishop of Chichester, but was successful in his resistance, thanks to the help of the King. He probably took part in the expedition to relieve Thouars in 1372. He was very rich and made heavy loans to the hard-pressed King.

FITZALAN, RICHARD, EARL OF ARUNDEL AND SURREY (1346–97). An English admiral and a leader of the barons against King Richard II. He was son of Richard and Eleanor Fitzalan and succeeded his father in 1376. He was one of the standing council appointed by the Good Parliament, was chief butler at Richard II's coronation, and in 1380 was made a commissioner to regulate the royal household. He had been appointed admiral of the West and accomplished very little, though French historians call his victory over the French off Margate (1387) the salvation of England from invasion. He joined the baronial opposition and attacked the King's favorites (1386). A year later the King, having got his judges to declare Arundel's commission illegal, tried to arrest him, but only strengthened the opposition and drove it to arms. In 1388 the Earl went to sea again and brought home much loot from La Rochelle. Later in the year, with the other lords appellant, he was retired from the council, but soon after was restored. Peace now seemed assured, but a personal quarrel between Arundel and John of Gaunt about 1393 renewed the trouble, and soon Fitzalan, his brother Thomas, who was Archbishop, Gloucester, and Warwick formed a conspiracy against the King. This was discovered by the King, and Arundel, urged by his brother, surrendered himself, was impeached, condemned, and executed. He had been very popular, and the people made pilgrimages to his tomb in the Augustinian Friars Church, Broad Street, London. His death hurried the end of the King's reign.

FITZALAN, THOMAS, EARL OF ARUNDEL AND SURREY (1381-1415). An English soldier under Henry IV. He was son of the third Richard Fitzalan and Elizabeth Bohun. On his father's death (1397), he was put in the brutal keeping of John Holland, Duke of Exeter. He finally escaped from Reigate and joined his uncle Thomas, the deposed Archbishop, and with him cast in his fortunes with Henry of Derby, with whom he landed at Ravenspur in 1399. Henry's success made Richard able to take vengeance on the Hollands; his estates and titles were restored, and he fought for several years against Owen Glendower, but accomplished practically nothing. In 1405 he helped put down the revolt of Scrope and Mowbray and put the leaders immediately to death, against the advice of his uncle. In 1405 he accompanied the King into Wales, where he fought with less ill fortune than before; and he married Beatrix, a natural daughter of John I of Portugal. He now joined the Beauforts, and Henry V named him treasurer, constable of Dover, and guardian of the Cinque Ports, and took him with him into France. He was taken sick at Harfleur and died on his return to England, leaving no children.

FITZBALL', EDWARD (properly BALL) (1792-1873). An English dramatist. He was born at Burwell, Cambridgeshire, was educated in a private school at Newmarket, and became a printer's apprentice in 1809. In 1819, after having unsuccessfully edited a magazine at Norwich, he changed his name to Fitzball, by prefixing his mother's name to his own, and began to write for the stage. His first success was won by his *The Innkeeper of Abbeville*, performed at the Norwich Theatre in 1820 and in London in 1821-22. This was followed in 1822, by an adaptation of *The Fortunes of Nigel* and an original drama entitled *Joan of Arc.* For the next 25 years Fitzball was the most prolific dramatic author in England, turning out an enormous number of comedies, tragedies, and melodramas, most of which were written to order for the managers of various metropolitan theatres. He was attached in succession to the Adelphi, Covent Garden, and Drury Lane theatres, as a stock dramatist. Among his numerous successes were: *Peveril of the Peak* (1823); *Waverly* (1824); *The Floating Beacon* (1824); *The Pilot* (1825), an adaptation of Cooper's novel, which ran over 200 nights; *The Flying Dutchman* (1828); *The Red Rover* (1828); *The Devil's Elixir* (1830); *Hofer, the Tell of the Tyrol* (1832); *Jonathan Bradford* (1833), a melodrama which ran over 400 nights at Covent Garden; *Tom Cringle* (1834); *Walter Tyrell* (1835); *Zazczizozu* (1836); *The Momentous Question; The Miller of Derwentwater; Nitocris* (1859). Besides numerous popular ballads and songs, he wrote the librettos for Balfe's operas, *The Siege of Rochelle* (1835), *Joan of Arc, Diadeste, Keolanthe* (1840), and *The Maid of Honor* (1847); for Donizetti's *La Favorita;* for Bishop's *Adelaide;* and Wallace's *Maritana*. He published his memoirs under the title *Thirty-five Years of a Dramatic Author's Life* (1859).

FITZ'GER'ALD. A city and the county seat of Ben Hill Co., Ga., 70 miles southeast of Macon, on the Seaboard Air Line, the Atlanta, Birmingham, and Atlantic, and the Ocilla Southern railroads (Map: Georgia, C 4). It contains cotton and oil mills, a cotton compress, fertilizer plants, and railroad repair shops, and carries on a trade in timber and turpentine. The water works and electric-light plant are owned by the municipality. Pop., 1900, 1817; 1910, 5795.

FITZGER'ALD, DESMOND (1846-1926). An American civil engineer, born at Nassau, New Providence, Bahama Islands, and educated at Phillips Academy, Andover, Mass. He spent 40 years in practice as a hydraulic engineer, chiefly in connection with the construction and maintenance of the water-supply system of Boston. From 1896 to 1900 he was a member of the Massachusetts Topographical Survey Commission, and in 1904 he served as consulting engineer for the sewage and water-supply systems of Manila, Philippine Islands. He was president of the American Society of Civil Engineers in 1899. His publications include *History of the Boston Water Works from 1868 to 1876* (1876), and *A Short Description of the Boston Water Works* (1895).

FITZGERALD, LORD EDWARD (1763-98). An Irish politician and revolutionist. The fifth son of the 17 children of the first Duke of Leinster, he was born Oct. 15, 1763, at Carton Castle, near Dublin, and educated in France. Fitzgerald joined the English army and in 1781 went to the United States. He was wounded at the battle of Eutaw Springs. In 1783 he returned to Ireland to represent Athy in the Irish Parliament. A taste for exploration afterward led him to journey by compass through the woods from Fredericton, New Brunswick, to Quebec. In 1790 he returned and sat in the Irish Parliament as member for Kildare. Attracted by the French Revolution, he visited Paris in 1792 and was cashiered from the English army for attending a revolutionary banquet at which he expressed Republican sympathies and renounced his title of nobility. During this visit he married the putative daughter of Philippe "Egalité," Duke of Orleans, and Madame Genlis, the celebrated Pamela, who was afterward discovered to be the child of Mary Sims, of Newfoundland, by De Brixey, a French captain. His sympathies with the struggles of his countrymen led him to join the United Irishmen in 1796, and he went to France to arrange, with the Directory, an invasion to support an Irish revolution. Soon after his return the plot became known to the English government, and Fitzgerald, after a desperate resistance, during which he was severely wounded, was captured and died in prison. His widow married Mr. Pitcairn, American Consul at Hamburg, but soon separated from him, and after a checkered existence died in poverty in Paris in 1831. Consult: Moore, *Life and Death of Edward Fitzgerald* (2d ed., London, 1875); Campbell, *Edward and Pamela Fitzgerald* (ib., 1904); Taylor, *Life of Lord E. Fitzgerald* (New York, 1904).

FITZGERALD, EDWARD (1809-83). An English poet and translator, whose exceptional qualities were obscured by an equally exceptional modesty, and whose fame is due almost wholly to his translation, from the Persian, of the *Rubáiyát* of Omar Khayyám. Although of Irish ancestry, he was born at Bredfield House, near the market town of Woodbridge in Suffolk; and it was here that he elected to spend his life in strict seclusion—almost a hermit's life in its sequestered tranquillity and remoteness from the outside world. The family name was Purcell, but on his grandfather FitzGerald's death (1818) his father took the arms and the name of his wife. He was educated at Trinity College, Cambridge, taking his degree in 1830, and there formed lifelong friendships with men since famous, among others Spedding and Thackeray. With the Tennysons he did not become intimate until later. A good picture of FitzGerald's academic life is preserved in *Euphranor*, his earliest printed work—a sort of Platonic dialogue, in which the speakers are thinly disguised under symbolic or classical names; and his lasting fondness for Cambridge is proved by the occasional visits he made down to his closing years. His brief experience of married life resulted unhappily. His wife was Lucy, daughter of Bernard Barton, the Quaker poet of Woodbridge and one of FitzGerald's closest friends. But he was temperamentally unfitted for matrimony, and they soon separated by mutual consent. Henceforth he contented himself with the companionship of his books and the luxury of a few chosen friendships. His simple life was varied by occasionally "pottering about the midland counties of England" or taking short coasting trips in his own yacht. A typical summer is described in his own words, as follows: "A little Bedfordshire—a little Northamptonshire—a little more folding of the hands—the same faces—the same fields—the same thoughts occurring at the same turns of road—this is all I have to tell of; nothing at all added—but the summer gone."

In literature, as in other things, FitzGerald was an epicure. He read slowly and of none but the best. Sophocles and Tacitus, Homer and Shakespeare, were the authors that he lived with. The Greek Anthology occupied him an entire season. Probably no writer who took the trouble to publish his writings has ever been so indifferent to their fate as FitzGerald. Just what first awoke him from his dreams among his turnips and spurred him on to authorship is not clear. In 1846 Carlyle and Professor Cowell, the Orientalist, became factors of importance in his life, and it may have been in a measure due to such mental stimulus that five years later *Euphranor* was published—anonymously, as with one exception were all his writings. A year later (1852) appeared *Polonius*, a collection of wise saws gathered from his favorite books and interesting to-day chiefly for its graceful preface. In 1853 the first of his famous translations appeared, *Six Dramas of Calderón*, with his own name appended; but an attack by an undiscriminating and unknown reviewer in the *Athenæum* effectually dampened his brief desire for personal glory; and neither the praise of men like Carlyle, Thackeray, and James Russell Lowell, nor the Calderón medal sent, he "doubts not, at Mr. Lowell's instance," could tempt him to write again under his own signature. FitzGerald's intimacy with Professor Cowell, which had ripened while they read together the plays of Calderón, culminated in their study of the Persian poets, and bore important fruit in FitzGerald's translation of the *Salámán and Absál*, of Jâmi, in 1856, and the *Rubáiyát* three years later. The story of how the now famous quatrains first claimed public attention is well known. FitzGerald offered some of "the less wicked" of them to *Frazer's Magazine;* but as they failed to appear, he made a present of them, two years later, to his publisher, Mr. Quaritch, who issued them in a brown-covered pamphlet at five shillings. In course of time they found their way to a penny box outside the bookseller's door. It was there that Mr. Whiteley Stokes bought the copy which he gave to Dante Gabriel Rossetti, who in turn passed it on to Mr. Swinburne and thus laid the foundation of the Omar cult in England.

Only once after this did FitzGerald arouse himself to activity—in the winter of 1864–65, when he published two more Calderón plays and his version of the *Agamemnon*. In 1880–81 appeared, privately printed, his translations of the two Œdipus tragedies. *Readings in Crabbe* (1882) was his last publication. Each year his life grew quieter; his days were spent "in boat or vessel as in a moving chair, dispensing a little grog and shag to those who do the work." There is less and less of literature in his correspondence. New books did not appeal to him, and he could see little merit in Emerson, George Eliot, or Victor Hugo. His old books continued to suffice; and the only new taste that he formed late in life was for the poems of Crabbe. And by a curious coincidence, he died while on a visit to the home of Rev. George Crabbe, a grandson of the poet.

Whatever merit FitzGerald's other writings possess, there is no question that they are quite eclipsed by his famous rendering of the *Rubáiyát*. As an instance of the deliberate transplanting of a poet from one nation to another widely separated by language and ideals and the lapse of centuries, and of having that poet take fresh root and flourish with renewed life, the *Rubáiyát* stands unique. FitzGerald's theory of translation was peculiar. He took great liberties with the original, aiming less to reproduce the exact thought than the atmosphere, and boldly rejecting whatever, through difference of social or artistic standards, might tend to arouse in Anglo-Saxon minds thoughts alien to the intention of the poet. Omar Khayyâm, almost unknown to European scholars until transmuted by the magic of FitzGerald's genius, is now probably the most familiar of all Persian poets to the Western world. Versions, in both prose and verse, have multiplied rapidly, many of them far more faithful to the original than FitzGerald's version; and wonder is sometimes expressed that none of these attains a similar popularity. It is only just beginning to be recognized that FitzGerald's *Rubáiyát* is held in honor, not as Persian, but as English poetry, and that to the great majority the sources are as unimportant as the sources of a play of Shakespeare. Whatever inspired him, the result is here—a piece of exquisite workmanship, "coral building in literature," as Edmund Gosse has defined it. The scrupulous care, the loving revision and endless polishing which finally resulted in the *Rubáiyát* as it stands to-day can be understood only by a comparison of the texts in the successive editions. The result is a rare delicacy of phrase, a fine instinct for the one appropriate word, that distinguished FitzGerald among the poets of his time and country.

Bibliography. *Euphranor* (1st ed. London, 1851; 2d ed., 1855); *Polonius* (ib., 1852); *Six Dramas of Calderón* (ib., 1853); *Salámán and Absál* (1st ed., ib., 1856; 2d ed., 1871); *Ru-*

báiyát of Omar Khayyám (1st ed., ib., 1859; 2d ed., 1868; 3d ed., 1872); *Agamemnon* (1st ed.; ib., 1865; 2d ed., 1876); *The Works of Edward FitzGerald* (London, 1887); *Letters and Literary Remains* (ib., 1889), ed. by William Aldis Wright; *Letters of Edward FitzGerald* (1894); *Letters of Edward FitzGerald to Fanny Kemble* (New York, 1895); *FitzGerald's Miscellanies* (London, 1900); *More Letters of Edward FitzGerald* (ib., 1901); *Variorum and Definitive Edition of the Writings of Edward FitzGerald* (New York, 1902–03), ed. by Bentham. Consult: Thomas Wright, *Life* (2 vols., London, 1904); A. C. Benson, *FitzGerald* (in "English Men of Letters Series," New York, 1905); an English prose translation from the original Persian by Justin Huntly McCarthy (London, 1889, and Portland, Me., 1896); FitzGerald's text, with commentary by H. M. Batson, and with an introduction by E. D. Ross concerned with the life and times of Omar (London, 1900); and *Centenary Celebration Souvenir* (Ipswich, 1909), for an account of the FitzGerald centenary.

FITZGERALD, George Francis (1851–1901). A British scientist, born at Dublin, Ireland, a son of Bishop William Fitzgerald. He was educated at Trinity College, Dublin, and became professor of natural and experimental philosophy at Dublin University. In 1888 he was appointed president of Section A of the British Association at Bath, and examiner to London University. Among his numerous publications are: "On the Possibility of Originating Wave Disturbances in the Ether by Means of Electric Forces," in the *Transactions of the Royal Dublin Society*, vol. i; *On an Analogy between Electric and Thermal Phenomena* (1884); *On the Limits to the Velocity of Motion in the Working Parts of Engines* (1886); and the posthumous *Scientific Writings of the Late George Francis Fitzgerald*, ed. by Joseph Larmor (1902).

FITZ-GERALD, James Newbury (1837–1907). An American Methodist Episcopal bishop, born at Newark, N. J. He was admitted to the State bar of New Jersey and was commissioned master of chancery in 1858. Ordained deacon in the Newark conference of his denomination (1864) and elder (1866), he served at various times as presiding elder of the Newark, Newton, and Jersey City districts; was member of the general conferences of 1876, 1880, 1884, and 1888 (serving as assistant secretary in 1876 and 1880); and was secretary of the Newark Conference for 11 years and recording secretary of the Methodist Episcopal Missionary Society from 1880 to 1888, when he was elevated to the episcopacy. In 1895 he made the episcopal visitation of the South American and European conferences. He received the degree of D.D. from Wesleyan University in 1880 and that of LL.D. from Hamline University in 1889. For many years he was a trustee of Drew Theological Seminary and vice president of the board. He was president (1897–1907) of the Ocean Grove Camp Meeting Association, a position which conferred upon him the duties and powers of mayor of a prominent summer resort, famous as a centre of religious and musical activities. He died at Hongkong, on an episcopal visitation to the Oriental mission conferences. Bishop Fitz-Gerald's mother, Mrs. John Driscoll (Osee Melinda Boylan) Fitz-Gerald, was president of the Women's National Holiness Association; an original member of the Women's and Children's Hospital; a manager of the Newark Female Charitable Society and of the Home for Aged Women; and founded and (until her death) was president of the board of managers of The Society to Provide and Maintain a Home for the Friendless in Newark, N. J.

FITZGERALD, John David, Lord (1816–89). An Irish jurist, born in Dublin. He was called to the bar in 1838 and was elected to Parliament in 1852 by the Liberals as representative for Ennis. When the first Palmerston ministry was formed three years later, he was made Solicitor-General for Ireland, and in 1856 he became Attorney-General and a member of the Irish Privy Council. In 1860 he left Parliament and was appointed a judge of the Queen's Bench in Ireland. He was appointed a lord of appeal, with a life peerage, in 1882, and at the same time received a position in the English Privy Council. He showed marked knowledge and ability in the House of Lords in his debates upon Irish questions, and his services on the judicial committee of the Privy Council were equally eminent. Many important charges were brought before him while upon the Queen's Bench in Ireland, including the cases of the Fenian conspirators in 1865–66, of Sullivan and Pigott for seditious libel in 1868, and of Parnell in 1880–81. In 1885 he refused the lord chancellorship of Ireland and an hereditary peerage.

FITZ-GERALD, John Driscoll, II. (1873–). An American Hispanic scholar, nephew of James Newbury Fitz-Gerald. He was born in Newark, N. J., graduated from Columbia University in 1895 (Ph.D., 1906), and also studied Romance philology at the universities of Berlin, Leipzig, Paris, and Madrid, becoming Elève titulaire (1897) and Elève diplômé (1902) de l'Ecole des Hautes Etudes, Paris. Between 1898 and 1909 he was assistant, tutor, and instructor at Columbia, and in the latter year he became assistant professor of Romance languages and literatures at the University of Illinois. In 1910 to 1913 he taught in the Columbia University Summer Session. In 1914 the American Association for International Conciliation sent him as delegate to South America. He became a member of the Hispanic Society of America and a corresponding member of the Spanish Royal Academy. He edited *La vida de Santo Domingo de Silos, por Gonzalo de Berceo* (1904), and (in collaboration with Leora A. Fitz-Gerald) Lope de Vega's *Novelas* (1913); is author of *Versification of the "Cuaderna Via" as Found in Berceo's Vida de Santo Domingo de Silos* (1905), *A Reading Journey through Spain* (1909), and *Rambles in Spain* (1910); had charge of Hispanic subjects in the second edition of the New International Encyclopædia; and is associate editor of the *Romanic Review*.

FITZGERALD, Oscar Penn (1829–1911). An American clergyman, born in North Carolina. He entered the ministry of the Methodist church South in 1853. For a time he was editor of the *Pacific Methodist* of San Francisco. From 1867 to 1871 he was Superintendent of Public Instruction for the State of California. At the same time he was ex-officio editor of the *California School Journal*. From 1878 to 1890 he was editor of the *Christian Advocate* of Nashville, Tenn. In 1890 he was selected Bishop of the Methodist Episcopal church

South. His works include: *California Sketches New and Old* (4th ed., 1880; 2d series, 1881); *Glimpses of Truth* (1883); *Centenary Cameos, 1784–1884* (1885); *Thomas O. Summers: A Biography* (1888); *Augustus B. Longstreet: A Life Sketch* (1891); *The Epworth Book* (1893); *John B. McFerrin: A Biography* (1893); *The Whetstone, the Day, and the Work* (1897); *Sunset Views* (1900); *Upper Room Meditations* (1903); *Fifty Years' Observations, Opinions, Experiences* (1903); *Class Meetings* (n.d.); *Daily Bread* (n.d.); *Christian Meetings* (n.d.). He was also the author of a series of sketches of early Methodists issued in pamphlet form.

FITZGERALD, Percy Hethrington (1834–). A British author and critic. He was born at Fane Valley, County Louth, Ireland, and was educated at Stonyhurst College, Lancashire, and at Trinity College, Dublin. He was called to the Irish bar and was for a time crown prosecutor on the northeastern circuit. Going to London, however, he became a contributor of fiction to Charles Dickens's magazine, *Household Words*, and later dramatic critic for the *Observer* and the *Whitehall Review*. In the long list of Mr. Fitzgerald's subsequent writings are numerous biographies and works relating to the history of the theatre; among them are: the *Life of Sterne* (1864); *Charles Lamb* (1866); *Life of David Garrick* (1868); *Life of George IV* (1881); *The Kembles; Life of William IV* (1884); *Lives of the Sheridans* (1886); *Henry Irving: A Record of Twenty Years at the Lyceum* (1893); *The Romance of the English Stage* (1874); *A New History of the English Stage* (1882); *Memoirs of Charles Dickens* (1914); *Worldlyman* (1914). With W. G. Wills he wrote *Vanderdecken*, which was brought out by Irving at the Lyceum. Consult his *Memoirs of an Author* (London, 1895).

FITZGERALD, Thomas (1796–1855). An American lawyer and politician, born at Germantown, Herkimer Co., N. Y. He served under Gen. W. H. Harrison in the War of 1812, was admitted to the New York bar, and removed to Indiana, where he became a member of the State Legislature, and thence to Michigan. In 1848–49 he represented Michigan in the United States Senate, filling the vacancy which resulted through the resignation from office of Gen. Lewis Cass. He was subsequently a leader in the councils of the Democratic party in Michigan. As a commissioner for the investigation of the so-called "wild-cat" banks, he greatly contributed towards their final eradication. In 1837 he became a regent of the University of Michigan.

FITZGERALD, Thomas, Lord Offaly, tenth Earl of Kildare (1513–37). A vice deputy of Ireland who acted for his father, Gerald, ninth Earl of Kildare, when he was summoned to London in 1534 to answer charges of maladministration as Lord Deputy. A rumor that his father had been executed in the Tower, and that the death of his uncles and himself had been determined upon, made him renounce his allegiance and declare war on the government. His first successes were tarnished by the murder of Archbishop Allen, and sentence of excommunciation was passed upon him. He besieged Dublin Castle, but had to retire, and Sir William Skeffinton crushed the rebellion by capturing Maynooth, the stronghold of the Geraldines, in March, 1535. Fitzgerald's father had been attainted and died in the Tower from the effects of an old bullet wound, but not before he had heard of and expressed gratification at his son's rebellion. Lord Thomas, after leading a wandering life for some months with a price set upon his head, surrendered to Lord Leonard Grey and was sent to England. He was committed to the Tower, with his five uncles, and although three of them had taken no part in the rebellion, the six Geraldines were drawn, hanged, and quartered at Tyburn, Feb. 3, 1537. Restitution of the family estates was made by Edward VI, and Queen Elizabeth repealed the bill of attainder. Consult Kildare, *The Earls of Kildare* (Dublin, 1858), and Lodge, *Peerage of Ireland* (ib., 1789).

FITZGIB'BON, Gerald (1837–1909). An Irish jurist born in Dublin. He was educated at Trinity College (Dublin) and was admitted to the Irish bar in 1860 and to the English bar in 1861. He became queen's counsel in 1872. He served as law adviser at Dublin Castle in 1876, as Solicitor-General of Ireland in 1877–78, and as bencher at King's Inn in 1877 and at Lincoln's Inn in 1901. He was Commissioner of National Education for Ireland in 1884–96, and Judicial Commissioner of Educational Endowments in 1885–97. From 1898 until his death he was Lord Justice of Appeal in Ireland. In 1904–05 he was chairman of the Trinity College Dublin Estates Commission.

FITZGIBBON, James (1781–1863). A Canadian soldier. He was born in Ireland and was indebted solely to his own exertions for his early education. As a private, he served in Holland in 1799 in the war against Napoleon and later (1801) before Copenhagen. Removing to Canada, he was given command of a small detachment in the War of 1812, and later he took part in several actions, including those of Stoney Creek and Fort George (at Niagara-on-the-Lake). At Beaver Dam Fitzgibbon, in command of 47 infantry soldiers and aided by a body of Indians, captured a force of Americans consisting of 450 infantry, 50 cavalry, and two guns. In 1822 he was appointed assistant adjutant general of militia in Upper Canada. During the Upper Canada rebellion of 1837–38 his foresight and rapid decision saved Toronto from the schemes of the disaffected. For this he received a land grant of 5000 acres and the thanks of the Legislature, but the land grant was never completed. Fitzgibbon was clerk of the Legislative Assembly in 1827–29 and clerk of the Legislative Council in 1829–35. He was created a military knight of Windsor in 1850. He afterward resided in England.

FITZGIBBON, John, Earl of Clare (1749–1802). An Irish statesman. He was born near Donnybrook and was educated at Trinity College, Dublin, and Christ Church, Oxford. He entered the bar in his native land in 1772, in 1778 became member of the Irish House of Commons for Dublin University, and in 1783 was appointed Attorney-General. In 1789 he became Lord Chancellor and was made Baron Fitzgibbon and began to exercise great influence in the House of Lords. He is chiefly remembered as the strongest personality that labored for the union of Ireland with England; and this fact, joined to his persistence in exerting his weighty influence against the Roman Catholics, has caused his name to be execrated by the most of his countrymen. But friends of his own party and religion balanced his severity with his sincerity, his insolence and bad temper with his bravery and ability, his vanity and ambition with his undoubted private virtues.

FITZGIBBON, Mary Agnes (1851–1915). A Canadian writer. She was born in Belleville, Ontario, and was educated there and at Pinehurst Academy, Toronto. In 1894 she founded the Women's Canadian Historical Society, of which she became corresponding secretary, and in 1905 she was one of the founders of the Female Immigrants' Receiving Home, Toronto. She published: *A Trip to Manitoba; or, Roughing it on the Line* (1880); *Home Work* (1887); *A Veteran of 1812* (1895; 2d ed., 1898), being a biography of her grandfather, Col. James Fitzgibbon; *Historic Days* (1898); *A Trip to Niagara* (1909); and, with Sara Mickle, *The Cabot Calendar, 1497–1897* (1897).

FITZHER'BERT, Alleyne, Baron St. Helens (1753–1830). An English diplomat, son of William Fitzherbert and of Mary Meynell, both friends of Dr. Johnson. He was educated at Derby and Eton, and at St. John's, Cambridge, where he got his degree in 1774. In 1777 he was made Minister to Brussels, and five years later he was sent to Paris to effect a treaty with France, Spain, and the United Provinces. He probably took a large part, as well, in the negotiations which led up to the peace with America. In 1783 he was sent to Russia and accompanied the Empress Catharine on her trip through the Crimea in 1787. At the end of this year he became First Secretary to the new Lord Lieutenant of Ireland, the Marquis of Buckingham. He held this post until the spring of 1789, when he went to The Hague as Envoy Extraordinary. Two years later he was sent to Madrid to settle the question of Nootka Sound and the Southern whale fishery; and in 1794 he was reappointed to The Hague, now as Ambassador. In 1801 he went on his last mission, to attend the coronation at Moscow, and concluded a treaty with Russia and an agreement with Denmark and with Sweden. He received the title of St. Helens in 1791, was pensioned in 1803, and lived his last years in London. He was not married.

FITZHERBERT, Sir Anthony (1470–1538). An English jurist, born in Derbyshire. He was educated at Oxford and Gray's Inn, was sergeant at law to Henry VIII (1516), became a judge, was knighted, and in 1524 was one of the peace commissioners to Ireland. Fitzherbert signed Wolsey's impeachment (1529), defended the second royal marriage, and was one of the judges in the More and Fisher trials. He reached his literary high-water mark with his first book, *La graunde abridgement* (1514), but he also wrote *The Office and Authority of Justices of the Peace* (1538) and the *New Natura Brevium* (1534); and possibly a *Book of Surveying and Improvements* (1523) and a *Book of Husbandry* (1523), both sometimes attributed to another Anthony Fitzherbert.

FITZHERBERT, Maria Anne (Smythe) (1756–1837). The unacknowledged wife of George IV of England. She was born on the estate of her father at Brambridge, Hampshire, and in 1775 married Edward Weld, who died in the same year. In 1778 she married Thomas Fitzherbert, who died in 1781. She first met Prince George of Wales, who was six years her junior, in 1785. The Prince fell in love with her on sight, but she refused to accept his attentions and spent some months on the Continent to escape them. In December, however, she returned to England and was married to him on the 21st of the month. The marriage was never either publicly avowed or disavowed by George, but it was known to both that the Marriage Act of 1772 invalidated any marriage contracted by a member of the royal family under 25 years of age without the King's consent. Mrs. Fitzherbert was a Roman Catholic, and by the Act of Settlement, if the heir apparent married a Roman Catholic, he forfeited his right of succession. There was a general understanding that a marriage had taken place, however, and she was received by the best society and by members of the royal family and was treated by Prince George as his wife. Some time before his marriage to Caroline he ceased for a time to live with her, but in 1800 the connection was resumed—after the Pope had formally ruled that the marriage with Mrs. Fitzherbert was valid—and continued until 1803, when it was finally terminated at her desire because of his attentions to Lady Hertford. William IV offered to make her a duchess and allowed her to use the royal livery. Consult Langdale, *Life of Mrs. Fitzherbert* (London, 1856), and Wilkins, *Mrs. Fitzherbert and George IV* (ib., 1905).

FITZHUGH', George (1802–81). An American sociological and political writer. He was born in Prince William Co., Va. Self-educated, he practiced law and began to write in defense of slavery, both in newspapers and in *De Bow's Review*. His remarkable philosophy of slavery, which was probably more extreme than that of any other Southerner, controverting all the principles of the Founders, including Jefferson, and expressed in a powerful way, was presented in *Sociology for the South, or the Failure of Free Society* (1854), and *Cannibals All, or Slaves Without Masters* (1856). He died at Huntsville, Tex.

FITZ-HUGH, Thomas (1862–). An American Latin scholar, born at Longwood, Goochland Co., Va. He was educated at the University of Virginia (A.M., 1883), and also studied at Rome and Pompeii, in Greece and the Orient, and at the University of Berlin. After teaching in North Carolina and Virginia for several years he was professor of Latin at Central University, Kentucky, in 1883–84 and at the University of Texas from 1889 to 1899, when he accepted a corresponding position at the University of Virginia. Besides his contributions to philological journals, his writings include: *The Philosophy of the Humanities* (1897); *Outlines of a System of Classical Pedagogy* (1900); *Prolegomena to the History of Italico-Romanic Rhythm* (1908); *The Sacred Tripudium* (1909; 3d ed., 1910); *The Literary Saturnian* (2 vols., 1910).

FITZINGER, fits'ing-ēr, Leopold Joseph (1802–84). An Austrian zoölogist, born in Vienna. In 1826 he published the work entitled *Neue Klassifikation der Reptilien nach ihren natürlichen Verwandtschaften*, which necessitated a complete remodeling of the system of Brongniart. He was appointed director of the Zoölogical Garden at Munich in 1863, and in 1865 he was called in the same capacity to Pesth, where he continued to reside until 1873. His works include: *Der Vögel* (1862–63); *Ueber das System und die Charakteristik der natürlichen Fahren der Vögel* (1856); *Der Hund*

und seine Rassen (1876); *Geschichte des Hofnaturalienkabinetts zu Wien* (1865–80).

FITZ-JAMES, fits-jāmz′, James (1670–1734). See Berwick, James Fitz-James, Duke of.

FITZMAU′RICE, Edmond George Fitzmaurice, Baron (1846–). An English diplomat. He was born in London, a son of the fourth Marquis of Lansdowne and of Emilie de Flahaut, and was educated at Eton and at Trinity College, Cambridge. He represented Calne in the House of Commons (1869–85) and Cricklade in 1898–1905. In 1880 he was made a commissioner for the reorganization of the Turkish provinces and Crete under the Treaty of Berlin, and he was Second Plenipotentiary at the Danube Conference (1882–83) and Undersecretary of State for Foreign Affairs in 1882–85 and 1905–08. In 1906 he was created Baron Fitzmaurice of Leigh, and in 1908–09 he was Chancellor of the Duchy of Lancaster and a member of the Liberal cabinet. He wrote on foreign politics, and a *Life of Lord Shelburne* (1875–77); *Sir William Petty, the Political Economist* (1895); *Life of Granville G. Leveson Gower, Second Earl Granville* (1905).

FITZMAURICE, Sir Maurice (1861–). An English civil engineer, educated at Trinity College, Dublin. He was apprenticed to the great engineer Sir Benjamin Baker. Fitzmaurice was engineer of design and construction (1904–08) of the Rotherhithe Tunnel under the Thames, and of such other works in England as the new Vauxhall Bridge, the Kingsway and tramway subway, the London electric tramways, and the extension of the London drainage system. He was engineer of the Nile reservoir dam at Assuan, completed in 1902. He wrote *Plate-girder Railway Bridges* (1895) and technical memoirs.

FITZMAURICE, Petty. See Lansdowne, Henry Petty-Fitzmaurice.

FITZMAURICE, William P. See Shelburne, Earl of.

FITZMAURICE-KELLY, James (1857–1923). An English writer on Spanish literature, Gilmour professor of Spanish language and literature at the University of Liverpool, and (1908) Norman MacColl lecturer at Cambridge. In 1907 he lectured at various American universities for the Hispanic Society of America, and received the honorary degree of L.H.D. from Columbia University. He became fellow of the British Academy, corresponding member of the Real Academia Española de la Lengua and of the Real Academia de la Historia (Madrid); and a Knight Commander of the Order of Alfonso XII. He contributed on Spanish literature to the eleventh edition of the *Encyclopædia Britannica* and to the *Cambridge Modern History;* wrote a *Life of Miguel de Cervantes Saavedra* (1892), *A History of Spanish Literature* (1898; in Spanish, 1901; in French, 1904; 2d ed. in French, 1913), *Lope de Vega and Spanish Drama* (1902), *Cervantes in England* (1905), *Chapters on Spanish Literature* (1908), *Miguel de Cervantes Saavedra: A Memoir* (1913), and *Bibliographie de l'histoire de la littérature espagnole* (1913); and edited *The Complete Works of Cervantes* (1901–), *Don Quixote*, with John Ormsby (1899–1900), and the *Oxford Book of Spanish Verse* (1913).

FITZPAT′RICK, Benjamin (1802–69). An American lawyer and politician. He was born in Georgia, but settled in Montgomery, Ala., where he made a reputation as a lawyer and became known as a man of exceptional integrity in public affairs. In 1840 he was a candidate for presidential elector on the Democratic ticket and was an active worker for Martin Van Buren. He was elected Governor of Alabama in 1841. From December, 1848, to March, 1849, he was in the United States Senate by appointment to fill a vacancy caused by death; and he again served from 1853 to 1861. During part of this time he presided over the Senate as president pro tem. In 1860 he was nominated for Vice President on the ticket with Douglas, but declined to run. When Alabama adopted her ordinance of secession in 1861, he retired from the Senate, but took no active part in Confederate affairs. He was president of the Alabama Constitutional Convention of 1865.

FITZPATRICK, Sir Charles (1853–). A Canadian statesman and jurist. He was born in Quebec, and was educated at Quebec Seminary and at Laval University, where he graduated in 1873 and was admitted to the provincial bar in 1876. In 1876 and again in 1887 he was appointed crown prosecutor for Quebec city and district. He soon attained high rank as a criminal lawyer, in 1885 was chief counsel for Louis Riel (q.v.), and in 1892 defended Honoré Mercier (q.v.) in the prosecutions following the fall of his administration. In 1890–96 he was a Liberal member of the Quebec Legislature, and in 1896–1906 was a member of the House of Commons. During his term in the House he was Solicitor-General (1896–1902) and Minister of Justice (1902–06) in the Liberal cabinet of Sir Wilfrid Laurier. In 1906 he was appointed Chief Justice of the Supreme Court of Canada. As one of the prominent Roman Catholic laymen of his province, he took part in the movement which resulted in the appointment of a papal ablegate to Canada in 1896. In 1902 he became a member of the Royal Commission for the revision of the public statutes, and in 1908 he was appointed a British member of The Hague Peace Tribunal. His outspoken sympathy with the cause of Irish home rule had made him a delegate to the Irish Nationalist Convention in 1896, and he was also a lay delegate to the first American Roman Catholic Missionary Congress in 1908. For some years he was professor of criminal law in Laval University. On several occasions during the absence of the Governor-General Fitzpatrick was appointed Administrator of the Canadian government. In 1907 he was knighted, and in the following year he became a member of the Imperial Privy Council. Harvard University conferred upon him the degree of LL.D. in 1914.

FITZPATRICK, Richard (1747–1813). An English soldier and politician. He was educated at Westminster School and there began his acquaintance with Charles James Fox. In 1765 he was appointed an ensign in the First Regiment of Guards. Fitzpatrick was induced to enter politics and in 1774 was elected to the House of Commons. He was opposed to the war with the American Colonies, but went to America in 1777 when he was ordered, fought at Brandywine and Germantown, and returned to England in 1778. In 1782 he was First Secretary to the Duke of Portland, Lord Lieutenant of Ireland. A year later he became Secretary for War in the ministry of Fox and North. But he was more noted as a wit and a beau, a gentleman of polished manners and courtly address, than as a politician. In 1796 he made a famous speech against Lafayette's imprisonment by the Austrians. He was made lieutenant general in 1798, general in 1803, and was again Secretary for War in 1806. After Pitt's death Fitzpatrick, 'though still in Parliament, took little interest in politics.

FITZPATRICK, William John (1830-95). An Irish author, born in Dublin. He was educated at the Catholic College in Clongowes Wood and at the University of Dublin. In 1876 he was appointed professor of history at the Royal Hibernian Academy. His works, chiefly biographical and dealing with Ireland's internal history before the Union, include: *The Life of Lord Cloncurry* (1855); *The Life, Times, and Correspondence of Dr. Doyle, Bishop of Kildare* (2d ed., 1880); *Lord Edward Fitzgerald* (1859); *The Sham Squire* (1866); *Irish Wits and Worthies* (1873); *Life of Charles Lever* (1879); *Life of Thomas N. Burke* (1886); *Daniel O'Connell, the Liberator: His Letters and Correspondence* (1889); *Secret Service under Pitt* (1892).

FITZRALPH', Richard (c.1295-1360). An English prelate, champion of the secular clergy against the mendicant friars. He was born at Dundalk, County Louth, Ireland, and educated at Oxford, where he became fellow of Balliol College, and chancellor in 1333. The following year he was made chancellor of Lincoln Cathedral, a little later Archdeacon of Chester, in 1337 dean of Lichfield, and in 1347 Archbishop of Armagh. He seems to have been a frequent and welcome visitor at the papal court at Avignon and met there in 1349 a delegation from the Armenians, who had applied to the Pope for aid against the Mohammedans. The Pope had required as a condition preliminary to giving his help that they abjure the 117 heresies with which they were charged, and the delegation was sent for consultation. Fitzralph took part in the negotiations and prepared an elaborate treatise, *Summa in Quæstionibus Armeniorum* (printed at Paris, 1511), which was believed to refute all the Armenian heresies. He also presented to the Pope at this time a petition from the secular clergy of England against the mendicant friars and was appointed to look into the matter. Returning to Ireland after 1350, he came out boldly against the friars. Between 1350 and 1356 he prepared and published a treatise on the questions at issue, *De Pauperie Salvatoris*, in seven books. In 1356 he preached so pointedly against the friars in London that they had him cited to defend himself before the Pope. He went to Avignon and preached there, before Innocent VI, a famous sermon, "Defensio Curatorum" (printed in Goldfast's *Monarchia*). He died at Avignon, Nov. 16, 1360, before the decision of the examiners was announced. In 1370 his bones were removed from Avignon to Dundalk, and pilgrimages were made to his tomb. Fitzralph was a popular preacher, and many of his sermons exist in manuscript. Consult Poole's edition of Wiclif's *De Dominio Divino* (Wyclif Society, London, 1890), where the first four books of the *De Pauperie Salvatoris* are reprinted.

FITZROY'. The name of two Australian rivers. 1. The Western Australian river of this name rises in the King Leopold Mountains and, after a westerly course of 300 miles through fertile, grass-covered plains, turns to the northwest, emptying into King Sound on the Indian Ocean (Map: Australia, Western, G 4). It was discovered in 1838 by Stokes. It is navigable for 100 miles. 2. The Queensland river is formed by the junction of the Mackenzie and the Dawson (Map: Australia, Queensland, F 7). It flows east into Keppel Bay on the Pacific coast, near the tropic of Capricorn. Ships of 1500 tons ascend to Rockhampton, 35 miles from its mouth.

FITZROY, Dukes of. See Grafton Fitzroy.

FITZROY, Robert (1805-65). A British naval officer. He was born at Suffolk, studied at the Royal Naval College, and entered the British navy in 1819. In 1828 he was put in command of the *Beagle*, employed in surveying the southern coast of South America under the orders of Captain King of the *Adventure*, and in 1831-36 he went on the *Beagle*, taking Charles Darwin, on another expedition. From 1843 to 1845 he was Governor and commander in chief of New Zealand. He was retired on half pay in 1850. In 1854 he became chief of the meteorological department of the Board of Trade. His *Weather Book* (1863) was a valuable contribution to meteorology, and he instituted a system of storm warnings. He committed suicide in 1865. He published: *Narrative of the Surveying Voyages of H. M. Ships Adventurer and Beagle* (3 vols., 1839), the third volume of which is by Darwin; *Remarks on New Zealand* (1846); *Barometer and Weather Guide* (1858); *Barometer Manual* (1861).

FITZSIM'ON, Henry (1566-1644). An Irish Jesuit. He was born in Dublin and was educated at Manchester, Oxford, Paris (where he was converted from Protestantism), and Rome. In 1592 he joined the Order of Jesuits and was shortly afterward made professor of philosophy in the Douai University. He did missionary work in Ireland (1597-99), for which he was arrested and imprisoned in Dublin Castle for five years. Released by order of James I, he went to Spain and then to Flanders, whence he visited Rome. After serving for some time as chaplain with the Imperial army in Bohemia, he returned to his native land in 1630. In 1641 he was found guilty of insurrection and had to flee to the mountains. His voluminous writings are chiefly controversial in character, upholding the Roman Catholic against the Protestant faith.

FITZWAL'TER, Robert (?-1235). An English baron, keeper of Hertford Castle. From a supporter, he became the leading opponent of King John, whom he accused of an attempt to seduce his daughter, and who banished him and plundered his estates (1213). Forced to recall him, John fought against the demands of Fitzwalter and his brother barons, but was brought to terms by the forces led by Fitzwalter, who was styled "Marshal of the army of God and Holy Church," and who compelled John to sign the Magna Charta. As one of the executors thereof, Fitzwalter was in terror of his life, was excommunicated, but bravely battled against the royal party on behalf of popular rights, even seeking aid from France. The help received proved to be a hindrance after the death of King John; but Fitzwalter continued his fight for freedom, and, though he was personally unfortunate, his party gained the day. In 1219 he turned Crusader for a year or two, but, being by this time an old man, he retired to England and found favor with Henry III.

FITZWILLIAM MUSEUM, The. A museum of art at Cambridge University, built from the proceeds of a bequest made by Richard, Viscount Fitzwilliam, in 1816. A fine collection of books, manuscripts, paintings, and engravings, left by its founder, has since been largely added to by numerous donations and bequests, of which the most important was by Charles Brinsley Marlay, of Trinity College (June, 1912). Among the painters represented are Holbein, Rubens, Gainsborough, Hogarth, and Turner. Rembrandt's "Man with Plumed Hat," Palma Vecchio's "Venus and Cupid," and a "Venus" ascribed to Titian are three of the chief treasures. The museum building is a fine example of Grecian architecture. An archæological museum is annexed to it, containing 600 casts from antique statues.

FIUME, fyōō'me, Croat. Rieka, rē-yä'kä. A royal free town and the seaport of Hungary, geographically a part of Croatia, but forming, together with its adjoining territory, since 1870, a political division of the kingdom (Map: Hungary, D 4). It is picturesquely situated at the head of the Bay of Quarnero, an inlet of the Adriatic, and is about 40 miles southeast of Triest. The views of the bay and town are beautiful, and the environs are attractive. Fiume consists of the old town built on a hill, with crooked narrow streets, and the new town stretching along the shore, with fine broad streets, handsome squares, and numerous elegant public buildings. The public garden is particularly worthy of mention. Among the edifices the most interesting are the cathedral (founded 1377), with a modern façade in the style of the Pantheon at Rome; the church of St. Vitus, a copy of Santa Maria della Salute at Venice; the Pilgrimage Church, approached by a stairway of 400 steps; the town hall, the government buildings, the Naval Academy, and the municipal theatre. There is a Roman triumphal arch, supposed to have been erected to Emperor Claudius II Gothicus. Fiume has several harbors, the largest, begun in 1872, being capable of accommodating 150 large vessels. It is protected by a breakwater 3250 feet in length, flanked by a quay nearly two miles long. The entire port is lighted by electricity.

The city, owing to the active interest shown by Hungary in this its only important seaport, has an extensive and steadily increasing commerce. In 1912, 16,513 vessels, of 3,184,120 tons, entered the port. The vessels clearing were 16,520, tonnage, 3,199,171. In 1911 Fiume's commercial fleet comprised 140 vessels, of 132,662 tons. The chief articles of import are wine, rice, tobacco, and raw jute; of export, flour, sugar, and lumber. The manufactures of Fiume are flourishing. The chief industrial establishments are the government tobacco factory, employing about 2000 persons, the large Whitehead torpedo works, an enormous petroleum refinery, a rice-shelling factory, an extensive paper mill, flour mills, saw mills, tanneries, and rope factories. The fisheries are important, those of tunny being especially rich. Fiume is fully equipped with banks, commercial unions, and industrial associations. It is administered by a governor, who is a member of the Upper House of the Hungarian Parliament. The town sends one representative to the Lower House. The chief educational institutions are the Naval Academy, a royal gymnasium, and two high schools. There is a United States consul. Fiume with its territory has an area of 21 square kilometers (8.1 square miles). The population (commune) in 1900 was 38,955; in 1910 (census of December 31), 49,866, chiefly Italians, Illyrians, and Croats. Of the total in 1910 over 45,000 were Roman Catholics and over 36,000 could read and write. Fiume was a town of the Byzantine Empire. In the ninth century it was ruled by its own dukes. In 1471 it came into the possession of Austria and in 1779 was attached to the crown of Hungary. From 1849 to 1870 it was a part of Croatia.

FIVE BOROUGHS, The. A term applied in old English history to Leicester, Lincoln, Nottingham, Stamford, and Derby, which the Danes held until 922, when they were reconquered together by Edward and Ethelfleda.

FIVE-FINGERS. See Starfish.

FIVE FORKS, Battle of. A battle fought, on April 1, 1865, in Dinwiddie Co., Va., 11 miles southwest of Petersburg, between a Federal force of about 25,000 under General Sheridan and a smaller Confederate force under General Pickett. Both Grant and Lee had perceived the importance of the Forks as a position from which to assail or to protect the Southside and Danville railroads, the two lines still open to Lee; and as part of his general movement by the left flank, Grant sent Sheridan's cavalry, afterward reënforced by the Fifth Corps under General Warren, to capture or drive away the Confederates stationed there. Lee meanwhile had sent forward a Confederate reënforcement of five brigades under Pickett. On March 31 Sheridan made an unsuccessful attack, but on the following day, reënforced by Warren's infantry, completely defeated the Confederates after a bloody fight lasting with little intermission throughout the day. The exact losses on either side were never ascertained, but the Confederates seem to have lost more than 5000 in prisoners alone, while the Federals lost fewer than 1000 in killed and wounded. Lee was forced to evacuate Petersburg on the morning of the 3d, and six days later surrendered his army at Appomattox. Consult: Johnson and Buel (eds.), *Battles and Leaders of the Civil War* (New York, 1887); Humphreys, *The Virginia Campaign of 1864 and 1865* (ib., 1883); Sheridan, *Memoirs* (ib., 1888); Alexander, *Military Memoirs of a Confederate* (ib., 1907); Steele, *American Campaigns* (Washington, 1909); *Official Records of the Union and Confederate Armies*, 1st series, vol. xlvi.

FIVE HUNDRED, Council of (Fr. *Conseil des Cinq Cents*). The Lower House of the Legislature established by the French constitution of the year III (1795). The constitution provided that two-thirds of the original body should be made up of members of the Convention. The Five Hundred initiated and discussed all legislation without taking action and then submitted their report to the Upper House, or Council of Ancients, which acted without discussion. On the 19th Brumaire, Year VII (Nov. 10, 1799), Napoleon dissolved the Five Hundred. See Directory; France; Napoleon I.

FIVE MEMBERS, The. After the presentation of the Grand Remonstrance (q.v.), Charles I resolved to take vengeance on the leaders of the parliamentary opposition. The bold course subsequently taken by them, notably the impeachment of the bishops and the supposed intention to impeach the Queen, fixed him in this unlucky resolve. On Jan. 3, 1642, he sent his Attorney-General, Sir Edward Herbert, before the Lords with articles of impeachment for high treason against five members of the Commons, Hampden, Pym, Holles, Strode, and Sir Arthur Haselrig—later one peer, Lord Mandeville, was included—charging them with attempting to subvert the fundamental laws of England, with inviting a foreign power to invade the kingdom, and with actually levying war against the King. The Lords were asked to sanction the arrest of the accused, but, instead of doing so, they appointed a committee to inquire whether it was according to law, and the Commons appealed to the city of London to have the trained bands in readiness. The sergeant at arms failed to secure the arrest of the accused members, and the impatient King himself undertook to take them by force. On January 4, Charles, urged on by his Queen, appeared with an armed retinue in the House of Commons and desired the Speaker to point out the culprits; but the impeached members had taken refuge in the city, whither they were soon followed by other members, who sat as a committee in the Guildhall. For the articles of impeachment presented to the Lords, consult: Gardiner, *Constitutional Documents* (2d ed., Oxford, 1899); and for discussion, id., *History of England* (New York, 1893-95), and Forster, *Arrest of the Five Members* (London, 1860).

FIVE-MILE ACT. An act passed by the English Parliament in 1665. It forbade nonconformist ministers who refused to take the nonresistance oath to come within five miles of any corporate town or borough, or of any parish in which they had taught or preached since the Act of Oblivion (unless they were traveling), under a penalty of £40 and six months' imprisonment. The act was not repealed till 1689.

FIVE NATIONS. See IROQUOIS.

FIVE POINTS. A locality of New York City northeast of the city hall, formed by the intersection of Baxter, Worth, and Park streets, formerly notorious as the haunt of low characters and criminals, now the site of Paradise Park. Improvements have completely altered the general aspect of the old Five Points; yet the streets of the vicinity still have features of considerable interest in the distinct settlements of Jews, Italians, and Chinese.

FIVE POINTS OF DOCTRINE. The topics in dispute between Calvinists and Arminians, viz., predestination, extent of the atonement, free will, grace, and final perseverance. Among the ineffectual attempts to settle the dispute were the quinquarticular controversy at Cambridge in 1594 and two conferences in 1626 in England and the Synod of Dort in Holland (1618-19.) See ARMINIANISM; DORT, SYNOD OF.

FIVES. See HANDBALL.

FIX, THEODORE (1800-46). An economist, born at Soleure, Switzerland. He went at an early age to France. He founded, in 1833, the *Revue mensuelle d'économie politique.* His chief book, *Observations sur l'état des classes ouvrières* (1846), attacked the doctrine of the right to work.

FIXED AMMUNITION. See AMMUNITION.

FIXED OILS. Oils which do not volatilize without decomposition. See OILS.

FIXING. The process in photography by means of which those portions of the sensitive silver salts that remain unaffected by light in the deepest shadow of the picture after the negative has been exposed are removed. The picture which remains is then permanently "fixed" on the negative and consists of metallic silver or silver oxide, to which the sensitive salt has been reduced by the action of the sun's light. Fixing is generally accomplished by sodium hyposulphite or potassium cyanide. The action of these substances depends upon the formation of double salts of silver with the alkali metals; these are soluble in water and are therefore readily washed away from the negative. In the daguerreotype process the picture was originally fixed on the silver plate by means of a boiling solution of gold and sodium hyposulphite, called *sel d'or.* See PHOTOGRAPHY.

FIXTURES (from *fix*, Fr. *fixer*, from ML. *fixare*, to fasten, frequentative of Lat. *figere*, to fasten). In English and American law, chattels which are so annexed or attached to the soil as to become, in legal contemplation, a part thereof. The term "land," in our legal system, comprehends not only the earth, but all the material improvements, such as houses, fences, and the like, which are permanently affixed thereto; and chattels which become so annexed lose their identity as chattels and their character of personal property and become land and real property. The general rule as to what constitutes a fixture legally immovable is that it must be either let into the earth or cemented or otherwise united to some erection previously attached to the ground, so that it would be waste to remove it afterward. But it must be remarked that a tenant may in all cases construct any erection he may make in such a manner as that it shall not become a fixture. Thus, if he erect even buildings—as barns, granaries, sheds, and mills—upon blocks, rollers, pattens, pillars, or plates, resting on brickwork, they may be removed although they have sunk into the ground by their own weight. But the mode of annexation to the freehold is not always conclusive as to its legal effect, as an article like a picture or a chandelier may be secured to the wall or ceiling of a room by screws or otherwise for a merely temporary purpose without becoming a fixture, and, on the other hand, a heavy object, as a statue or monument, resting upon the ground of its own weight, but intended for the permanent improvement of the premises, may become a part of the freehold.

In general, however, there must be an actual annexation to the soil, and where that exists the article annexed usually becomes a fixture. To this rule various exceptions have been made in favor of what have been called trade fixtures, or fixtures erected by a tenant for life or for years for the purpose of carrying on a trade, and this principle has been extended by the courts to a variety of ornamental and domestic fixtures added to the premises by such a tenant. The exception does not go to the length of holding that such articles do not acquire the character of fixtures, but merely permits their removal by the tenant at or before the end of his term. If the removal be delayed beyond that time, the right is lost, and generally the same result follows the taking of a new lease by the tenant without reserving such right of removal. In the case of a life tenant such fixtures may be removed by his executor within a reasonable time after the tenant's death.

While in the United States the law governing the annexation and removal of fixtures is in general the same as in England, certain minor details differ. For instance, the English discrimination against the removal by a tenant of buildings erected by him for agricultural purposes has been generally disregarded in the United States. It must be remarked also that the rule is different as between different parties. As between landlord and tenant, the rule favors the tenant. As between grantor and grantee and mortgagor and mortgagee, the tendency is to consider doubtful articles as fixtures. So, as between heir and executor, the basis of the rule is that the intention of the person making the attachment shall be considered in doubtful cases; and that generally where removal would cause an injury to the freehold a permanent fixture will be presumed to have been intended. An interesting question in regard to the rolling stock of railroads has received much attention from the courts. The results reached have been diametrically opposite in different States, some courts holding that the rolling stock is not a part of the road proper and would not be covered by a general mortgage of the real estate, and other tribunals deciding, on a similar state of facts, that the rolling stock would form a part of the realty. The former view has generally come to prevail. Consult Ewell, *Treatise on the Law of Fixtures* (2d ed., Chicago, 1905). See Landlord and Tenant; Real Property, and the authorities there referred to.

FIZEAU, fē'zō', Armand Hippolyte Louis (1819–96). A French physicist, born in Paris. His father was a doctor and professor in the medical faculty of the University of Paris. In 1839 he began researches for a method to make permanent the pictures taken by the Daguerre process. He worked for some time with Foucault, and they separated only to have the better chance of progress in determining the velocity of light. Fizeau's apparatus won the prize of 10,000 francs in 1856 for this work and seven years later he became a member of the Academy of Sciences. His works on the velocity of light, on the interference of rays, on the dilatation of crystals, on spectroscopy, on the polarization of light, and on the speed of electricity, are to be found in the *Annales de physique et de chimie* and in the *Comptes rendus de l'Académie des Sciences*.

FJORD. See Fiord.

FLABEL'LUM (Lat., fan). A sort of fan whose liturgical use is of pre-Christian origin. The Apostolic Constitutions, in the fourth century, prescribed its use in the eucharist from the consecration to the communion; two deacons were to stand, one on each side of the altar, and gently wave fans of leather, linen, or peacock's feathers, to keep insects away from the chalice. Traces of a similar use in the West are found as late as the fourteenth century. Various specimens are still preserved, one magnificent specimen, adorned with pictures of saints and dating from the eighth century, in the abbey of Tournus. On certain festivals, when the Pope is carried in the *sedia gestatoria*, two private chamberlains accompany him with *flabella* of peacock and ostrich feathers, and the same custom is observed in the procession of Corpus Christi.

FLAC'CUS, Gaius Valerius Flaccus Setinus Balbus. A Roman poet who is supposed to have died about 88 A.D. Absolutely nothing is known regarding his life. He is the author of an epic poem on the Argonautic expedition, based on the poem by Apollonius Rhodius. This work in its extant form is incomplete. The general opinion of scholars is that the work is rather a specimen of learned mediocrity than of genuine inspiration. It shows much study of Vergil. The *editio princeps* of the *Argonautica* appeared in 1472. The best modern edition is that of Bährens (Leipzig, 1875). An English metrical translation was published by one Nicholas Whyte as early as 1565. Consult: Teuffel, *Geschichte der römischen Literatur*, vol. ii, § 317 (6th ed., Leipzig, 1910); Harmand, *De Valerio Flacco Apollonii Rhodii Imitatore* (Nancy, 1898); Stroh, *Studien zu Valerius Flaccus* (Munich, 1905).

FLACCUS, Marcus Verrius. A Roman freedman, teacher, and savant of the reigns of Augustus and Tiberius. He was the most learned man of his day and the tutor of the grandson of Augustus. He wrote an antiquarian work, *De Verborum Significatu*, giving in alphabetical order an explanation of little known or obsolete words and a description of old rites and customs. This valuable work was afterward abridged by Festus (q.v.) and has itself disappeared. Flaccus also compiled a calendar of Roman festivals, known as *Fasti Prænestini*, which was set up in the forum of Præneste, where fragments of it have been found. Consult: Nettleship, *Lectures and Essays*, 1st series (Oxford, 1885); Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1910); Schanz, *Geschichte der römischen Litteratur*, § 341 (3d ed., Munich, 1911). See Fasti.

FLACH, flȧsh, Jacques Geofroi (1846–). A French historian, born at Strassburg, Alsace, and educated at the university of his native city (LL.D., 1869). He was an advocate at the Court of Appeals in Paris from 1872 to 1892 and professor at the Ecole d'Architecture from 1873 to 1874. In 1877 he became professor at the Ecole des Sciences politiques and in 1884 professor also at the Collège de France. His most important work, *Les origines de l'ancienne France* (3 vols., 1886–1904), deals with the formation, growth, and decay of the feudal system. In 1912 Flach was elected a member of the Academy. His writings include: *De la subrogation réelle* (1870); *Histoire du régime agraire de l'Irlande* (1883); *Jonathan Swift* (1886); *Etudes critiques sur l'histoire du droit romain au moyen âge* (1889); *L'Origine de l'habitation et des lieux habités en France* (1889).

FLACHAT, flȧ'shȧ', Eugène (1802–73). A French engineer. He was born at Nîmes and received his education chiefly from his elder brother, Etienne, in association with whom he was engaged from 1823 to 1830 in elaborating the plan for a canal between Havre and Paris. After studying dock construction in England he returned to France, where he devoted himself to railroad engineering. He was chief engineer of the Chemin de Fer d'Est until 1857, when he was appointed to the same position in the Chemin de Fer du Sud. In 1848 he and others founded the Société des Ingénieurs civils de France, of which he was the first president and president in all for seven years. His principal literary productions include: *Etablissements commerciaux, docks de Londres, entrepôts de Paris* (1836); *Rapport sur le canal du Rhône au Rhin* (1840); *Les chemins de fer de 1862 et 1863* (1863); *Traité de la fabrication du fer*, with Barrault and Petiet (3 vols., and atlas, 1842–46; Ger. trans., 1847–51); *Mémoire sur les* *travaux de l'isthme de Suez* (1865); *Navigation à vapeur trans-océanienne* (2 vols., 1867).

FLACIUS, flā'shĭ-ŭs (properly **FLACH** or **VLACICH**), Matthias (1520–75). A German Lutheran theologian and controversialist. Born at Albona, Illyria (and hence called Illyricus), he studied at Venice, Basel, Tübingen, and Wittenberg, and in 1544 was appointed to the chair of Hebrew at Wittenberg. Here he strongly opposed the Leipzig Interim (see Interim), and for his attacks upon Melanchthon was obliged to resign his post in 1549. In 1557 he received a professorship at the new University of Jena. In a discussion with Viktorin Strigel, a member of the Jena faculty, on will as a factor in conversion, he affirmed that original sin was a portion of the substance of the present character of humanity and thus he became discredited as a Manichæan. He was removed from his professorship in 1561 and thereafter was driven from one place to another. It has been supposed that he was somewhat unbalanced; at any rate, he was dogmatic and obstinate. He is still known for his valuable work in biblical interpretation and church history, including the material prepared by him for the Magdeburg Centuries (q.v.), and the noteworthy *Clavis Scripturæ Sacræ* (1567). For his biography, consult Twesten (Berlin, 1844) and Preger (Erlangen, 1859–61).

FLACOURT, flȧ'kōōr', Etienne de (1607–60). A French colonial officer and author, born at Orléans. He commanded the royal troops at Fort Dauphin, Madagascar (1648–55), and added the Ile de Bourbon to the possessions of the crown. Isolated from France, he acted on his own responsibility and exercised great severity in restoring order and putting down a rebellion among the native population. After returning to France he published three works of importance: *Petit catéchisme madécasse et français* (1657); *Dictionnaire de la langue de Madagascar* (1658); and *Histoire de la grande île de Madagascar* (1658; 3d ed., 1664). A genus of thorny shrubs common in Madagascar and in parts of Asia and Africa is called *Flacourtia* in his honor. Consult A. Malotet, *Etude de Flacourt, ou les origines de la colonisation française à Madagascar* (Paris, 1898).

FLAD, Henry (1823–98). An American civil engineer, born in Bavaria, Germany. He was educated first at the college of Spire, Rhenish Bavaria, and after a two years' course in the School of Engineers, University of Munich, graduated as a civil engineer in 1846. He was assistant engineer on improvements to the river Rhine and other government public works until 1849, when he was elected captain of a pioneer company in the revolutionary army of Baden. The revolution failed, and he was sentenced to death, but escaped to the United States in the same year. There he rose in the engineering departments of various railways in New York and the Central Western States until in 1861 he enlisted in the Civil War, at the close of which he was a colonel of engineers. He then settled in St. Louis and became chief assistant to James P. Kirkwood, a notable hydraulic engineer. From 1867 to 1874 he was chief assistant engineer to Capt. James P. Eads on the construction of the St. Louis Bridge over the Mississippi River. From 1867 to 1875 he was a water commissioner of the city of St. Louis, and for many years after 1877 he was president of the Board of Public Improvements of that city. He was president of the American Society of Civil Engineers in 1886. For several years before his death he was a member of the Mississippi River Commission.

FLAG (ODutch *vlagghe*, Dutch *vlag*, Dan. *flag*, Swed. *flagg;* connected with dialectic Swed. *flage*, to flutter in the wind, ODutch *flaggheren*, *vlaggheren*, to flag, droop). A cloth of light material capable of being extended by the wind and designed to make known some fact or want to spectators. In the army a flag is the ensign carried as its distinguishing mark by each regiment, and also a small banner with which the ground to be occupied is marked out. In the navy the flag is of more importance, often constituting the only means vessels have of communicating with one another or with the shore.

The records of the form of objects used as ensigns are frequently to be found among the remains of earliest civilizations. Among the Persians, Greeks, and Romans various devices were used as standards in time of war, the Roman eagle being a well-known instance of this usage. It is not, however, until the Middle Ages that anything appears which is in the modern sense a flag. Among these may be mentioned the oriflamme, the sacred banner of all France. It is well known how the banner of William the Conqueror was sent to him by the Pope. In the mediæval period the banner was not only a personal ensign, but it denoted also that he who bore it was the leader of a military force.

Among modern standards may be mentioned the Union Jack, the national flag of the British Empire, in which are combined in union the crosses of St. George, St. Andrew, and St. Patrick; and the tricolor, which is the sole flag of France. It is divided vertically into three parts of equal width.

Naturally the standard English flag was used by the American Colonies in their early days, and this was commonly the cross of St. George and later the union cross, the former consisting of a white banner with a red cross. The Puritan spirit was shown when Endecott (q.v.) cut the cross from the flag because it was a Romanist emblem and a relic of Antichrist. The Colonial flags varied in color, it being sufficient if ground and cross differed. Now and then a pine tree or a hemisphere was figured in the upper left-hand quarter of the cross, and one flag had only the tree for a symbol. When Sir Edmond Andros was Governor, he established a special flag for New England—a white field with a large St. George cross, and in the centre "J. R."—*Jacobus Rex* (James, King), surmounted by a crown. The Revolution and the pre-Revolutionary controversies brought in all manner of devices for flags and banners, the larger portion bearing mottoes more or less defiant of the British government. Soon after the fight at Lexington the volunteers from Connecticut put on their flags the arms of the Colony, with the legend *Qui transtulit sustinet* (He who brought us over sustains us). The Colonial flag of New Amsterdam (substantially the present arms of New York City) was carried by armed vessels sailing out of New York—a beaver being the principal figure, indicative of both the industry of the Dutch people and the wealth of the fur trade. A month after Bunker Hill, Putnam displayed a flag with a red ground, having on one side the Connecticut motto and on the other side the words then recognized as the motto of Massachusetts, "An Appeal to Heaven." The earliest vessels sailing under Washington's authority displayed the pine-tree flag, though a combination of that and other flags was sometimes used. Many privateers, however, adopted a device consisting of a mailed hand grasping a bundle of 13 arrows. An early flag in the Southern States was designed by Colonel Moultrie and was displayed at Charleston in September, 1775. It was blue, with a white crescent in the upper corner next the staff; afterward the words "Liberty or Death" were added. At Cambridge, Mass., on Jan. 1, 1776, Washington displayed a flag consisting of 13 stripes of red and white, with the British union jack in a blue canton in place of the stars, the stripes being considered emblematic of the union of the 13 Colonies against British oppression. The rattlesnake flag was often used, the snake being coiled to strike, and the motto, "Don't tread on me." The snake's rattles generally numbered 13.

No official action was taken with regard to a national flag until June 14, 1777, when the Continental Congress passed a resolution, "That the flag of the thirteen United States be thirteen stripes, alternate red and white; that the union be thirteen stars, white in a blue field, representing a new constellation." The origin of this design has been the subject of much controversy, which has left the subject unsettled, though many writers have considered the design to have been suggested by the coat of arms of the Washington family, which contains both the stars and the stripes. Paul Jones claimed to have been the first to raise the new flag over a naval vessel, and it seems that the first use of the Stars and Stripes on land was at Fort Stanwix, where a hastily improvised flag was raised on Aug. 3, 1777. (See FORT STANWIX.) The flag was used at the battle of Brandywine and thereafter in all important engagements until the close of the war. On Jan. 13, 1794, Vermont having been admitted to the Union in 1791 and Kentucky in 1792, Congress enacted, "That from and after the first day of May, one thousand seven hundred and ninety-five, the flag of the United States be fifteen stripes alternate red and white; that the union be fifteen stars, white in a blue field," the intention apparently being to add both a stripe and a star for each new State admitted. In 1818, however, the number of States having increased to 20, Congress enacted that the number of stripes be reduced to 13, to typify the original 13 States; that the number of stars be increased to 20; and that "on the admission of every new State into the Union, one star be added to the union of the flag, and that such addition shall take effect on the Fourth of July next succeeding such admission." There are now 48 stars on the flag, arranged in six rows of eight each, two stars having been added in 1912 by the admission of New Mexico and Arizona. The union jack consists of the blue ground, without stripes, having the stars in white. It is used by pilots and in the bow of boats for ambassadors and ministers. During the Civil War the seceding States had a number of distinct flags. Early in 1861, however, their Congress decided upon what was popularly called the "Stars and Bars," which was composed of three broad horizontal bars, the two outer ones red and the middle one white, with a blue "union" containing seven white stars in a circle. The number of stars was subsequently increased to 13. The Confederate battle flag used throughout the war consisted of a field of red on which was a blue St. Andrew's cross bordered with white and bearing 13 white stars. In 1863 the Confederate Congress adopted a flag having a white field with a union or canton of the battle flag. This was sometimes mistaken for a flag of truce, so in 1865 a red bar was imposed across the end of the field. See Plates under UNITED STATES.

There are many flags which designate special or official position or authority, such as royal standards, the President's flag, and the Secretary of the Navy's flag. The President's flag, which is carried at the main of naval vessels and on boats in which he embarks, is blue, with the coat of arms of the United States. The Secretary of the Navy's flag is blue and has a white foul anchor in the centre surrounded by four white stars. The flag of the revenue marine has 16 perpendicular red and white stripes alternating. The "union" carries the coat of arms of the United States and occupies the width of eight stripes. The flags of the flag officers of the United States navy are blue, carrying white stars—four stars for the admiral and two for rear admirals. In case two or more rear admirals are in company, however, the one second in rank flies a red flag with two white stars and the junior rear admirals fly white flags with two blue stars. The commodore's flag is no longer in use, since the grade of commodore on the active list was abolished in 1899. The revenue flag, used to indicate the jurisdiction of the Treasury Department, was adopted in 1799. The flag of the Secretary of War is of scarlet bunting, having upon it an eagle with outstretched wings. Garrison, post, and storm flags are national flags made of bunting. The flag of the Geneva Convention in connection with the national flag is used for army hospitals.

When a naval vessel enters a foreign port it hoists the flag of that country and at the same time gives a salute of 21 guns. In foreign countries the royal standard is displayed at ceremonies in honor of the sovereign or at which the sovereign may be present, and it, or the national ensign of the country, is hoisted at the main of vessels aboard which such sovereign goes. When ministers, consuls, etc., leave men-of-war that they have officially visited, the flag of the nation to which they belong is hoisted at the fore upon their departure, during the firing of a salute in their honor. A flag placed at "half-mast" is a sign of mourning. A flag reversed, or with the union down, indicates distress. When saluting is done with the flag, the salutes are made by "dipping" it, usually three times, i.e., hauling it down a few feet and then running it up again. In the navy, when the flag is hoisted at "colors" or hauled down at sunset, all officers and men are required to salute it.

Flag captain, or *fleet captain*, is an unofficial title applied to the captain of the flagship. He is announced as "chief of staff" by a general order issued by a commander in chief upon taking command. A separate officer for this duty is no longer ordered in the United States navy. Consult: Preble, ***History of the Flag of the United States*** (Boston, 1872); for official designs to scale, ***Flags of Maritime Nations*** (Washington, 1899); Harrison, ***Stars and Stripes and Other American Flags*** (Boston, 1914); Champion, ***Our Flag, 1607–1910*** (4th ed., New Haven, 1910). See HERALDRY, *National Coats of Arms;* STORM AND WEATHER SIGNALS; NATIONAL FLAGS.

FLAG (probably ultimately identical with *flag*, banner, from its waving in the wind). A popular name for many monocotyledonous plants with sword-shaped leaves, mostly growing in moist situations. It is sometimes particularly appropriated to species of the genus *Iris*, or flower-de-luce; but is also given indiscriminately to plants of similar foliage, as the sweet flag (*Acorus calamus*) and the catstail reed (*Typha*). See IRIS.

FLAG′ELLANTS (Fr. *flagellant*, It. *flagellante*, from Lat. *flagellare*, to scourge, from *flagellum*, scourge, diminutive of *flagrum*, whip). The name given to certain bodies of fanatical enthusiasts, who at various intervals from the thirteenth to the sixteenth century made their appearance in different countries of Europe, proclaiming the wrath of God against the corruption of the time, inviting sinners to atone for sin by self-inflicted scourgings or flagellations, and themselves publicly enforcing this exhortation by voluntary scourging of themselves and by other forms of self-castigation. These fanatical movements recurred at frequent intervals. The most remarkable, however, are two in number. The first originated at Perugia in 1260, at a time when society in Italy was greatly disorganized by the long-continued struggles of the Guelph and Ghibelline factions and by a severe plague in 1259. The disorders of the time favored the movement, and it soon became so formidable as to draw upon itself the suspicion of Manfred, the son of Frederick II, by whom it was vigorously suppressed. Early in 1261 it had died out in Italy. Some of the flagellants appeared in Bavaria, Austria, Moravia, Bohemia, Poland, and France, when to their extravagant practices they added still greater extravagances of doctrine. In virtue of a pretended revelation, they asserted that the blood shed in self-flagellation had a share with the blood of our Lord in atoning for sin; they mutually confessed and absolved each other and declared their voluntary penances to be a substitute for all the sacraments of the church and for all the ministrations of the clergy. The Jews suffered from their fanatical fury in many of the towns of Germany and the Netherlands. The second outbreak of flagellantism originated in Germany in 1349. Its immediate occasion was the terror inspired by the plague known as the Black Death, which devastated Europe in a fearful manner during 1347–49 (consult Hecker, *Epidemics of the Middle Ages*, Eng. trans., London, 1846). These fanatics went about the country in organized bands, each member bound by an oath to render implicit obedience to the leader, to abstain from all physical pleasures, and to submit to scourgings and tortures for a period of 33 days in commemoration of the 33 years of the life of Jesus. They wore a cloak with red crosses sewed upon it and red crosses on the hat. In regular procession they proceeded from town to town and in the public places threw themselves on the ground and scourged one another, singing penitential songs and exhorting the bystanders. The movement, attended with some beneficial results at first, soon became marked by excesses. From Germany it spread to the Netherlands, Switzerland, Sweden, and even England. The flagellants were rigorously excluded from France, but made their way into Avignon, then the papal residence, and were condemned by Clement VI. After 1350 bands of flagellants appeared only sporadically. In 1414 a new troop of flagellants, locally called *Flegler*, appeared in Thuringia and Lower Saxony under the lead of one Conrad Schmidt. They renewed and even exaggerated the wildest excesses of their predecessors, rejecting all the received religious usages and all external worship, placing their entire reliance on faith and flagellation. The violence of these fanatics drew upon them the severest punishments of the Inquisition. Nearly 100, among them Schmidt, were burned at Sangershausen in 1414, and others perished in other places. Their doctrines, comprised in 50 articles, were condemned by the Council of Constance (1414–18). Nevertheless they appear occasionally until 1454, after which year they cease to be mentioned. Independent of this movement bands of "scourgers" appeared in Spain, southern France, and north Italy towards the close of the fourteenth century, under the lead of Vincent Ferrer. They wore a long white garment, veiling head and features, and from this received the name of *albi*, white. In large companies they went through the towns, praying, singing, and scourging one another. After the Council of Constance they gradually disappeared.

On the general subject, consult: Förstemann, *Die christlichen Geisslergesellschaften* (Halle, 1828); Cooper, *Flagellation and the Flagellants* (London, 1896); Lea, *History of the Inquisition* (New York, 1875) and *History of Auricular Confession and Indulgences* (ib., 1896); Heimbucher, *Die Orden und Kongregationen der katholischen Kirche* (Paderborn, 1897); Zöchler, *Askese und Mönchtum* (Frankfort, 1897).

FLAGELLATA, flăj′ĕl-lā′tȧ (Neo-Lat. nom. pl., from Lat. *flagellum*, whip). In zoölogy, a name often applied to the class Mastigophora (q.v.) of the order Protozoa (q.v.), but now restricted to an order of that group. In botany, a large group of organisms presenting a combination of plant and animal characters, but now thought to be most closely related to the Volvocales. (See ALGÆ.) The Flagellata are one-celled, active, aquatic forms, with one or two (sometimes more) cilia. The cell is naked or with a distinct membrane, and the protoplast shows contractile and amœboid movements, and contains a nucleus, a pulsating vacuole, and in many forms distinct green or brown chromoplasts. Some of them are very animal-like in taking food, ingesting solid particles; and their usual multiplication by longitudinal splitting is not plantlike. No sexual reproduction is known, but the frequent formation of thick-walled resting spores is suggestive of plants. It has been suggested that the Flagellates may be regarded as the starting point for one-celled plants (as Volvocales) on the one hand and for such animals as the Protozoa on the other.

FLAGELLATES. See FLAGELLATA.

FLAGELLATION. An ecclesiastical punishment which has been used from the fifth century on clerical, monastic, and lay individuals. As a means of self-discipline and aid in attaining the heights of ascetic piety, it found early use in the religious communities. The Roman Catholic church holds the lawfulness, and even the meritorious character, of voluntary self-chastisement, if undertaken with due dispositions, practiced without ostentation or fanaticism, and animated by a lively faith and a firm hope in the merits of Christ (cf. 1 Cor. ix. 27; Col. iii. 5). This is the self-castigation known under the name of "the discipline" and has been encouraged, under ecclesiastical guidance, by the Jesuits in various countries. This, however, has no connection with the flagellants (q.v.) of earlier ages.

FLAGEL'LUM DE'I (Lat., The Scourge of God). A title given to Attila, King of the Huns.

FLAGEOLET, flăj'ō-lĕt (OF., Fr. *flageolet*, dim. of OF. *flageol*, Prov. *flaujol*, flute, from ML. **flautiolus*, little flute, from *flauta*, flute, from Lat. *flatus*, blast, from *flare*, to blow). A wind instrument of the flute family. It was made of boxwood or ivory, in several pieces, and had holes for the fingers, like the flute. Its compass was from g^1 to $b^3\flat$, and the tones sounded a fifth higher than written. The flageolet differed from the flute in so much that it had a mouthpiece and was also played in a vertical instead of horizontal position. The character of the tone was somewhat similar to that of the ordinary flute, but more mellow. The instrument is not used in the orchestra to-day. Mozart employed it, but since his time no other composer has made use of it. See FLUTE.

FLAGEOLET TONES. An obsolete name for harmonics (q.v.).

FLAGET, flȧ'zhȧ, BENEDICT JOSEPH (1763–1850). A bishop of the Roman Catholic church in America. He was born in Contournat, Auvergne, France, and was educated at the College of Billom and at the College of the Sulpicians at Clermont, becoming a member of that order in 1783. He was ordained a priest in 1788 and held a professorship of dogmatic theology at the University at Nantes and at the Sulpician Seminary at Angers. In 1792 he was compelled to flee from France and settled in America, first at Baltimore, and later as chaplain at the military post of Vincennes, in the newly organized Northwest Territory. In 1795 he returned East and accepted a professorship in Georgetown College, where he remained three years. In 1798 he went to Havana, returning in 1801 with 21 Cuban students to be educated at Georgetown, where he resumed his professorship. In 1808 he was appointed Bishop of Bardstown (Ky.), with an extensive diocese that reached from the Alleghanies to the Mississippi and from the Great Lakes southward to the thirty-fifth parallel. He spent the years 1808–10 in Europe and was consecrated on his return in the latter year. He entered upon his duties in the face of great difficulties with remarkable energy; and his exertions were crowned with unusual success. He resigned his see in 1829, but was persuaded to withdraw his resignation. By 1834 he had erected four colleges, an orphan asylum for girls, 11 academies for girls, and had introduced into his diocese three religious sisterhoods and four religious orders for men. He spent the years 1835–39 in Europe. In 1841 the seat of his diocese was removed to Louisville, where his activities continued until his death.

FLAGFISH. A coral fish (*Heniochus macrolepidotus*) of Japanese and Philippine waters, so called from the fancied resemblance of its slender erectible dorsal fin to a flagstaff. See Colored Plate of PHILIPPINE FISHES.

FLAGG, ERNEST (1860–). An American architect, born at Brooklyn, N. Y. After studying at the Ecole des Beaux-Arts, Paris, under Blondel, he became a practicing architect in New York City in 1891. He was architect of St. Luke's Hospital, New York, the Corcoran Gallery of Art, Washington, the United States Naval Academy, Annapolis, Md., the Singer Building, New York, and other important buildings. He is also author of many magazine articles on model tenements, roads, and pavements.

FLAGG, GEORGE WHITING (1816–97). An American historical and genre painter. He was born at New Haven, Conn., and studied in Boston under his uncle, Washington Allston. His picture "The Murder of the Princes" (New York Historical Society) attracted the attention of Lumen Read, who enabled him to study for three years in Italy. Later he spent three years in London, and after his return to America he was elected (1851) to the National Academy of Design. Flagg painted historical compositions, sentimental single figures, and ideal heads with a certain skill and feeling; but although his paintings are harmonious in color, they are without enduring merit. He is best represented in the New York Historical Society, which possesses 13 of his paintings, including "The Execution of Lady Jane Grey" and the "Little Match Girl." His painting "Washington Receiving his Mother's Blessing" is widely known through engravings.

FLAGG, ISAAC (1843–). An American classical scholar, born at Beverly, Mass. He graduated in 1864 from Harvard University (where he was tutor in Greek in 1865–69), and studied at the universities of Berlin and Göttingen (Ph.D., 1871). He held the professorship of Greek at Cornell University in 1871–88 and was associate professor of classical philology and Greek at the University of California from 1891 to 1909, when he became professor emeritus. He edited: *The Hellenic Orations* of Demosthenes; *The Seven against Thebes* of Æschylus; *Iphigenia among the Taurians* of Euripides; the *Lives of Cornelius Nepos;* Plato's *Apology* and *Crito*. Besides *Versicles, Hylēthen* (1896), and other poems, he is author of *Outline of the Temporal and Modal Principles of Attic Prose* and *A Writer of Attic Prose* (1902).

FLAGG, JAMES MONTGOMERY (1877–). An American illustrator, portrait painter, and author. He was born at Pelham Manor, N. Y., and studied at the Art Students' League, New York City, at Herkomer's Art School, Bushey (England), and under Victor Marec in Paris. At the age of 14 he published his first drawing in *Life*. An illustrator for numerous magazines, he also wrote (and illustrated) a number of volumes—poetry and prose—of which the best known are: *Tomfoolery* (1904); *If: A Guide to Bad Manners* (1905); *Why They Married* (1906); *All in the Same Boat* (1908); *City People* (1909); *I Should Say So* (1914). Flagg was early recognized as a keen observer, a facile and able technician, and a faithful portrayer, with great fertility of ideas and inexhaustible humor. His work in charcoal, crayon, pen and ink, and oils shows equal proficiency in these mediums. One of his best portraits in oil is that of Mark Twain, in the Lotos Club, New York.

FLAGG, JARED BRADLEY (1820–99). An American painter and clergyman, born in New

Haven, Conn. He studied art under his brother, George Whiting Flagg, and his uncle, Washington Allston, and practiced in New Haven as a portrait painter before his removal to New York in 1849. He was elected to the Academy of Design in 1850, but became a clergyman in the Episcopal church in 1854, and was for eight years rector of Grace Church, Brooklyn Heights, N. Y. Though Dr. Flagg painted mildly sentimental figures, notably "Hester Prynne in Prison," portrait painting was his specialty. His portraits of William M. Evarts (1887) and Chief Justice Church hang in the State Capitol at Albany. Among his other portraits were that of Commodore Vanderbilt, exhibited at Philadelphia in 1876, and of John Jay. He published *Life and Letters of Washington Allston* (1829).

FLAGG, WILSON (1805–84). An American naturalist, born at Beverly, Mass. After three months of residence at Harvard he studied medicine, which he never practiced, and later became a contributor to the *Weekly Magazine*, the *Post*, and the *Atlantic Monthly*, all of Boston. He at first wrote on politics, but soon turned his attention to natural history and particularly to ornithology. In 1844–48 he was connected with the customhouse of Boston. His publications include: *Analysis of Female Beauty* (1834); *Studies in the Field and Forest* (1857); *The Woods and Byways of New England* (1872; reprinted as *A Year among the Trees*, 1881); *Birds and Seasons of New England* (1875; reprinted in 3 vols. as *A Year with the Birds*, 1889).

FLAG'LER, HENRY M. (1830–1913). An American capitalist, born at Canandaigua, N. Y. He was for a time a clerk in a country store, then a manufacturer of salt in Saginaw, Mich., and later a member of the firm of Rockefeller, Andrews, and Flagler, Cleveland (Ohio) oil refiners. After this firm was succeeded by the Standard Oil Company he was long prominently connected with this corporation; he resigned his vice presidency in 1908 and his directorship in 1911. As the builder and owner of the Alcazar and Ponce de Leon hotels, St. Augustine, Fla., he did much to make that city a popular winter resort. He was also chairman of the board of directors of the Florida East Coast Railway and director of the Western Union Telegraph Company, the Pennsylvania and Occidental Steamship Company, and the Cuba Company.

FLAG OFFICER. In the United States navy, an officer entitled by his rank to carry at the masthead a flag instead of a pennant, indicative of his command. At present the flag officers are admirals, who carry the flag at the main, vice admirals, who carry it at the fore, and rear admirals, who carry it at the mizzen. In case a ship has but two masts they are called the fore and main; the flag of a rear admiral is then hoisted at the main. (For admiral's flag, see Colored Plate of FLAGS, UNITED STATES.) Previous to the abolition of the grade of commodore (q.v.), officers of that rank were included among the flag officers. See ADMIRAL.

FLAG OF THE PROPHET (Ar. *sinjaq sharif*, noble standard). The sacred banner of the Mohammedans. It was originally of a white color and was composed of the turbans of the Koreish, captured by Mohammed. A black flag was, however, soon substituted in its place, consisting of the curtain that hung before the door of Ayesha, the favorite wife of the Prophet. This flag, regarded by the Mohammedans as their most sacred relic, was first held by the successors of Omar at Damascus; it afterward fell into the hands of the Abbassides, caliphs of Bagdad, and at a later period was brought into Europe by Amurath III. It was covered with 42 wrappings of silk, deposited in a costly casket, and preserved in a chapel in the interior of the seraglio, where it is guarded by several emirs, with constant prayers. The banner unfolded at the commencement of a war, and likewise carefully preserved, is not the same, although it is believed by the people to be so.

FLAG OF TRUCE. A white flag exhibited by one of two contending forces, indicating a desire to communicate. The necessity of occasionally communicating with the enemy in time of war, and the fact that this can usually be best done by means of a flag of truce, has given to the latter a sort of sacred character, which is recognized by all civilized people and by many savages as well, and a violation of the recognized immunities of the flag and of its bearers is regarded as just ground for retaliation and punishment. The immunities of the bearer are not, however, absolute. If it appear during an engagement, firing need not terminate, and if the bearer or a person accompanying him be killed or injured, there is no ground for complaint. Deliberate firing upon a party bearing a flag of truce, unless they have been warned not to proceed, is regarded as a breach of the military or naval code. A flag of truce, to have the ordinary immunity, must be sent by the senior officer present, and it can only be received at the will of the senior officer of the other side. In a naval battle the vessel bearing it should not attempt to proceed beyond a point at which her character can be easily ascertained; should she attempt to go farther she may be warned by a shot across her bow, and if she does not then stop she will be fired into. Having been warned to stop, she must then await the pleasure of the enemy; if he declines to communicate, she must perforce retire, but this is unusual. The detention of a flag of truce beyond the lines is a protection to the receiving side against espionage, torpedo attack, etc. Any attempt to obtain information of the enemy's position, condition, or force through a flag of truce may subject the bearer to trial as a spy. In any case he may be detained as a prisoner if the receiver deems it desirable. In dispatching a flag of truce, except during an engagement, the flagship of the senior officer should keep her colors flying and a white flag at the fore; and if the senior officer of the enemy receives the flag bearer, his ship should do likewise during the progress of the conference, and afterward until the flag-of-truce boat has reached its own lines. The boat carrying the flag should be met at the proper point by one in charge of an officer of suitable rank from the other senior officer, which should fly a white flag while going and returning.

FLAG'STAFF. A town and the county seat of Coconino Co., Ariz., on the Santa Fe Pacific Railroad (Map: Arizona, D 2). It is situated 6935 feet above sea level and is south of the San Francisco Mountains, one of which, San Francisco Peak (12,800 feet), is of particular interest, being an extinct volcano. The Northern Arizona Normal School is here, and to the northwest of the town is the Lowell Observatory. Flagstaff has extensive live-stock and lumber interests and a trade in Indian curios and Navajo blankets. A railroad extends from the vicinity of the town to the Grand Cañon of the Colorado. The town owns its water-works system, costing $300,000. Pop., 1900, 1271; 1910, 1633.

FLAG'STONE (*flag*, Icel. *flaga*, slab, from *flagna*, to flake off + *stone*, AS. *stān*, Icel. *steinn*, Ger. *Stein*, stone). A rock which splits into tabular masses, or flags, of various sizes and thickness, along the original planes of stratification. Flagstones are generally sandstones, containing more or less argillaceous or calcareous matter; some, however, are indurated clays and others thin-bedded limestones. They are used for pavements, cistern linings, etc. Bluestone is a variety of sandstone of Devonian age found in New York, Pennsylvania, and New Jersey. It forms the basis of a large industry. Other formations yielding flagstones are the Carboniferous of Ohio and Pennsylvania, the Triassic brownstone of Connecticut, and the Hudson River and Potsdam formations of New York. Consult Ries, *Building Stones and Clay Products* (New York, 1912).

FLAHAUT DE LA BILLARDERIE, flȧ'ō' de lȧ bē'yär'drē', AUGUSTE CHARLES JOSEPH, COMTE DE (1785–1870). A French soldier and diplomat, born in Paris. His father, intendant of the Royal Garden (1792), was guillotined in 1793, and his mother, later the Marquise de Souza, took him to England. He returned in 1798, accompanied Napoleon into Italy, and was made lieutenant at Marengo. In 1811 Queen Hortense, with whom he had a liaison, gave birth to the Duc de Morny. In 1813 he became general of division, and afterward Napoleon appointed him to treat for peace with the Allies; but this task was too much for Flahaut's diplomacy. After the Emperor's return from Elba he fought under him at Waterloo, and upon the French defeat upheld Napoleon's son, the King of Rome, went to England as an exile, and married there Lady Keith, a peeress in her own right, and did not return to France until 1827. The revolution of 1830 restored him to his titles. He was made Minister Plenipotentiary to Berlin in 1831; from 1841 to 1848 was Ambassador to Vienna. He was one of the ministers who drew up for Louis Napoleon the constitution of 1852; and under the Second Empire he was Senator (1853) and Grand Chancellor of the Legion of Honor (1864). From 1860 to 1862 he was Ambassador to the Court of St. James's. Consult A. de Maricourt, *Madame de Souza et sa famille* (Paris, 1907).

FLAIL. See THRESHING.

FLAM'BARD, RANULF (?–1128). Bishop of Durham in the time of William II and Henry I. He was a Norman of humble origin who took holy orders and became chaplain to William Rufus, who in 1099 made him Bishop of Durham and one of his principal advisers. To obtain money for the King he resorted to oppressive measures which earned him the hatred of the people. His extortions were so flagrant that a plot was formed against his life; but the conspirators quarreled, and the Bishop was spared. As soon as William died Henry I sent Flambard to the Tower. He escaped and fled to Normandy, where he instigated Duke Robert to an invasion of England and accompanied the Duke on the expedition. Later he was pardoned and restored to the bishopric of Durham. Thenceforward Flambard appears to have led a more edifying life, devoting himself to important architectural works. Consult: Stubbs, *Constitutional History of England*, vol. i (Oxford, 1897); Freeman, *William Rufus* (ib., 1882); Rounds, *Feudal England* (London, 1895); Davis, *England under the Normans and Angevins* (ib., 1905).

FLAM'BOROUGH HEAD. A promontory of the Yorkshire coast, England, extending into the North Sea. It forms the north boundary of Bridlington Bay, terminating in a range of perpendicular chalk cliffs, 6 miles long, 300 to 450 feet high, which are being constantly washed down by wave attack (Map: England, G 2). It contains many caverns and outlying picturesque rocks, which swarm with sea fowl. On the head is a lighthouse, 85 feet high, standing 214 feet above sea level, its light visible 25 miles. At the centre of the promontory is the village of Flamborough. Across the peninsula, ending in the head, runs an early British intrenchment, with two lines of breastworks, called Dane's Dike.

FLAMBOY'ANT (Fr. *flamboyant*, pres. part. of *flamber*, to flame, OF. *flamber*, *flamer*, from Lat. *flammare*, to flame, from *flamma*, flame; connected with *flagrare*, to blaze, Gk. *φλέγειν*, *phlegein*, to burn, Skt. *bhrāj*, to be bright, AS. *blāc*, shining, pale, Icel. *bleikr*, pale, Eng. *bleak*). The name given to the latest style of Gothic architecture in France. It prevailed there during the fifteenth and early sixteenth centuries and corresponds to the Perpendicular (q.v.) in England. The name is derived from the flame-like forms of the tracery which replaced the earlier geometric tracery with its circles and triangles and which appears not only in windows, but also on wall surfaces, buttresses, choir screens, and woodwork. Other characteristics are the minuteness and intricacy of all the carved ornament; the multiplication of subordinate decorative buttresses and pinnacles; the use of flattened elliptical or surbased arches; the ogee-formed drip moldings over all kinds of arches, running up into extravagantly long finials; the tall and slender bases; the exuberance of minute tabernacle canopies and pinnacles, and the treatment of the moldings. These last abound in broad, shallow hollows, separated by narrow fillets and sometimes filled with naturalistic vine foliage. Special delight was taken in making diverse moldings cross and intersect. Capitals are often omitted from the piers, and the arch moldings are allowed to "die" into the piers or carried without interruption down to the ground or to the pier bases. The vaulting is sometimes, though not often, provided with decorative ribs and ridges; never, however, approaching the type of the contemporary English fan vaulting (q.v.). The effect is intricate rather than beautiful, suggestive, like the rest of the style, of ingenuity in stone cutting rather than vigor of design, and, in spite of great richness of detail in parts, the general effect is often thin and cold. The most successful examples of the style are apt to be minor works, like choir screens and inclosures (Amiens, Chartres, Brou, Aubi), pulpits (Strassburg), and choir stalls. There are many large buildings in France executed in this style; the most remarkable are Saint-Maclou at Rouen, Saint-Jacques at Dieppe, Saint-Riquier near and Saint-Wulfrand at Abbeville, the west façades of the cathedrals of Rouen, Tours, and Troyes, the Palais de Justice at Rouen, and the church of Brou. Some of the spires of this period are also very beautiful; the northern spire of Chartres Cathedral is one of the finest in France. In England, also, Flamboyant tracery was introduced at the close of the Decorated period, but was so quickly superseded by the Perpendicular style that it did not form a separate style; it is there called "flowing," or "curvilinear," and can be seen at Lincoln (south transept), Ely (south aisle and triforium), Carlisle, and Wells. The corresponding stage of Gothic development in Spain, Germany, and the Netherlands is rather merely florid than based upon any clear principle of design, such as the Flamboyant.

FLAME (OF. *flambe*, Fr. *flamme*, Portug. *flamma*, from Lat. *flamma*, flame). An incandescent gaseous mixture usually produced by the chemical combination of various combustible substances with the oxygen of the air. A flame generally consists of several parts, differing from one another in temperature, color, illuminating power, etc. The flame of a lamp or candle, or simple gas jet, consists of a hollow cone, in the centre of which there is no combustion. The central space appears dark only by contrast with the luminous cone which surrounds it. It consists, in reality, of colorless substances which are constantly rising into the flame. If a glass tube, open at both ends, be held obliquely in the flame of a candle, with its lower extremity in the dark central space above the wick, it will conduct away a portion of the combustible vapor, which may be kindled like a gas jet at its upper end. The inner cone is enveloped by a bright luminous area in which the processes of chemical combination are more energetic, and which furnish most of the light yielded by the candle. The luminous cone is in its turn surrounded by an envelope emitting but little light and having a yellowish color; this part of the flame consists of a mixture of the products of combustion with air, all heated to incandescence.

Temperature. The temperature of a flame (usually about 2000° C. = 3632° F.) depends mainly on the heats of combustion of the burning gases and the specific heats of the products of combustion. The amounts and the specific heats of other gases that may be present likewise exert their influence on the temperature of the flame, part of the heat of combustion being consumed in raising the temperature of such gases; thus, the temperature of a gas burning in pure oxygen is considerably higher than that of the same gas burning in air, owing to the presence of cold nitrogen in the latter. Part of the heat of combustion is also lost in the decomposition of carbonic acid in the flame. At elevated temperatures carbonic-acid gas partly dissociates into carbonic oxide and oxygen, according to the following equation:

$$\underset{\text{Carbonic acid}}{2CO_2} = \underset{\text{Carbonic oxide}}{2CO} + \underset{\text{Oxygen}}{O_2}$$

The degree of dissociation is the greater, the higher the temperature and the lower the pressure of carbonic acid during the process. Since the ordinary illuminants contain a high percentage of hydrogen, the amount of carbonic acid produced during their combustion is relatively small; or, in other words, the partial pressure of carbonic acid in the flame is low and its degree of dissociation is correspondingly high, as much as one-tenth of the carbonic acid being often broken up according to the above reaction. The amount of sensible heat thus consumed is therefore very considerable.

Luminosity and Color. The luminosity of flames, such as those obtained by burning coal gas or a candle, is due mainly to the incandescence of the carbon particles produced by the chemical decomposition of the combustible gases. If enough air is mixed with the latter previous to their entering the flame, complete combustion takes place as soon as the hot part of the flame is reached; there is, consequently, no separation of solid carbon, and the flame is practically nonluminous throughout. This is the principle of the well-known Bunsen burner. That solid carbon exists in an ordinary luminous flame may be readily shown by holding in it a glass rod or a piece of white porcelain, a coating of carbon being then deposited in the form of soot. A certain amount of light, however, is also produced by the incandescence of the gases themselves; this amount of light emitted is proportional to the capacity of the gases for absorbing the same kind of light at the temperature of the flame. The luminosity of a flame depends greatly on its temperature and increases even more rapidly than the latter; the luminosity of ordinary flames is considerably diminished by the dissociation of carbonic acid, since the dissociation causes a fall of temperature. Another one of the factors determining the luminosity of a flame is the density of the medium in which combustion takes place, an increase of density usually causing a corresponding increase of luminosity. Thus, in air kept under a constant pressure of about 10 atmospheres, hydrogen burns with a bright flame; on the contrary, under sufficiently diminished pressures a candle may burn with a pale, nonluminous flame. The size of a flame depends on the pressure, the temperature, and the diffusibility of the reacting substances, on the form of burner used, etc.

The color of a flame is determined mainly by the nature of the substances that may be introduced into it. Thus, sodium imparts to a flame a bright yellow color, potassium a characteristic violet color, copper usually a green color, strontium a crimson color, etc. Many chemical substances may be identified by introducing them into the colorless flame of a Bunsen burner, the color imparted to the flame often revealing the nature of the substance. The luminosity of flames artificially colored by the introduction of foreign substances is usually slight. For use in polariscopic measurements, in which a strong light of a single color (monochromatic light) is required, Rosanoff has devised a burner by which an intensely luminous flame is produced through the addition of small amounts of oxygen to the air used in the combustion, while the required color of light is produced, as usual, by the introduction into the flame of common salt (yellow light) or some similar substance.

FLAMEL, flȧ'mĕl', Nicolas (c.1330-1418). A French calligrapher, who was supposed to have succeeded as an alchemist. He was born probably at Pontoise, but practiced his craft in Paris, where he became legal writer to the University. His school for the teaching of penmanship, illuminating of manuscripts, etc., flourished, and he may have been a money lender as well as teacher and scrivener. At any rate, he gained great wealth, part of which he distributed in ostentatious charity, while part he used in building a house of highly decorated exterior, afterward known as "l'hostel Flamel," opposite the church of Saint-Jacques-de-la-Boucherie. He wrote two treatises on alchemy, but it was largely because of his wealth, evident but unexplained to the popular mind, that he was credited with the power of turning a baser metal into gold. Fact and fiction about him were first definitely disentangled by Abbé Vilain in his *Histoire critique de Nicolas Flamel* (Paris, 1761). Consult also Didot, *Biographie générale* (Paris, 1856).

FLAMENG, flȧ'mäɴ', François (1856–1923). A French portrait and historical painter, born in Paris. He was the son and pupil of Léopold Flameng and afterward studied painting under Cabanel, Laurens, and Hédouin. In 1879 he exhibited "The Girondins Summoned," which created much comment. This ambitious work was followed by "The Conquerors of the Bastile" (1881, Rouen Museum); "Marie Antoinette on her Way to the Scaffold" (1885), and a series of graceful and gallant court scenes from the time of Louis XV, the Directorate, and the First Empire. He also painted two large battle scenes, "The Charge at Waterloo" (1898) and "Eylau" (1902, Luxembourg), in which the minuteness of detail detracts from the interest of the whole. A popular portraitist, Flameng often imitates the theatrical backgrounds and style of Nattier, but is at his best in his mural paintings in the Opéra Comique, Paris, and on the stairway of the Sorbonne, consisting of seven subjects from the history of that institution. He became an officer of the Legion of Honor, a member of the Institute, and professor at the Ecole des Beaux-Arts.

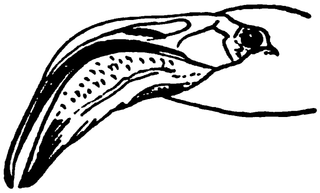
FLAMENG, Léopold (1831–1911). A French line engraver and etcher, born in Brussels of French parentage. He was the pupil of Calamatta and Gigoux in Brussels, and then went to Paris (1853), where he at first attempted original etching, but without success. In 1859 he began his connection with the well-known journal, the *Gazette des Beaux-Arts*, which established his reputation as one of the foremost engravers and etchers of the day. The most remarkable feature of Flameng's plates is the facility with which he interprets artists working in every style and all kinds of pictures, ancient or modern, always using the medium best adapted to the particular subject. Among his finest plates are: "The Death of the Virgin," after Martin Schoen; "The Charge of the Artillery," after Schreyer; "Phryne," after Gérôme; "Miss Graham," and the "Blue Boy," after Gainsborough; "The Source," after Ingres; "The Hundred Florin Piece" and the "Night Watch," after Rembrandt; the "Death of Sainte Geneviève," after Laurens. His other works include 40 etchings for Blanc's *Œuvre complet de Rembrandt* (1859), and 32 etchings for the *Théâtre complet de Molière* (1876–83), after Louis Leloir. Flameng received the medal of honor in 1886, the first prize in 1900, and was named officer of the Legion of Honor in 1894. See Plate of Shakespeare.

FLAMENG, Marie Auguste (1843–93). A French landscape and marine painter, born at Jouy-aux-Arches, near Metz. He studied under various masters, ending with Delaunay and Puvis de Chavannes, and began to exhibit in 1870. After 1874 he devoted himself to marines. His "Fishing Boat at Dieppe" (1881), in the Luxembourg, is a good example of his vigorous, fresh treatment of sea subjects. Among his other paintings are: "Fishing Boats" (Museum, Nancy); "Loading Oysters at Cancale" (Toul); "The Dock of the Messagerie Maritime at Bordeaux" (Mülhausen).

FLA'MENS (of doubtful origin). In the ancient Roman religion, sacrificial priests, each of some special divinity. They were sometimes chosen for life, sometimes annually; sometimes were attached to *collegia;* sometimes, especially outside of Rome, were independent. The most important were those attached to the College of Pontifices, originally 15 in number, of whom 12 (*flamines minores*) were plebeians and seem early to have been neglected, as the names of only 9 or 10 are known. The remaining three (*flamines maiores*, or simply *flamines*) were always patricians, and were the *flamen Dialis*, *flamen Martialis*, *flamen Quirinalis*. All of these were bound by a strict ceremonial, which for a long time prohibited them from holding any other office; and, though this rule was relaxed from about 200 B.C., permission to hold military command or to be absent from Italy was never granted to the *flamines Diales* and only very late to the others. The *flamen Dialis* (of Jupiter) was bound by very strict regulations. He could not take an oath, mount a horse, see an army, or even any one at work; he must keep carefully aloof from all impurity, and must always wear his official dress, fastened with brooches, for no knot was allowed; on his head he must have the *pilleus*, a pointed cap, on the top of which an olive twig was fastened by a fillet of wool. He was also forbidden to pass a night away from his house. His wife, the *flaminica*, a priestess of Juno, was bound by similar restrictions, and in case of her death the flamen was obliged to resign. (Consult Aulus Gellius, *Noctes Atticæ*, x, 15.) These restrictions were accompanied by privileges—the curule chair, the *toga prætexta*, the attendance of a lictor, and a seat in the Senate. A prisoner who entered the house of the *flamen Dialis* was at once freed from his chains, and he who touched his knee could not be executed on that day. The office was found so burdensome that during the last century of the Republic it remained unoccupied for 75 years. The *flamines* were installed in the Comitia Calata and were chosen by the *pontifex maximus* from three candidates nominated by the *pontifices*. Other flamens were the *flamines curiales*, *flamines divorum* for the worship of the emperors, and the *flamen arvalium*, belonging to the Arval Brothers (q.v.). The flamens offered daily sacrifices; on October 1 the three *flamines maiores* sacrificed on the capitol to *Fides Publica*. Consult: Marquardt, "Römische Staatsverwaltung," in *Handbuch der römischen Altertümer* (Leipzig, 1885); Jullian, in Daremberg and Saglio, *Dictionnaire des antiquités grecques et romaines* (Paris, 1896); Greenidge, *Roman Public Life* (London, 1901); May, *Revue des études anciennes*, vii (Paris, 1905); Frazer, *The Golden Bough*, i, 242 ff. (2d ed., London, 1911).

FLAMIN'GO (Portug., older form *flamengo*, Sp. *flamenco*, from Portug. *flammant*, *flambant*, OF. *flaman*, *flambant*, Fr. *flamant*, flamingo, flaming, pres. part. of Portug. *flamar*, OF. *flamer*, to flame, from Lat. *flamma*, flame; influenced in popular etymology by Portug. *Flamengo*, Sp. *flamenco*, Fr. *Flamand*, Fleming).

One of a group of water birds of remarkable appearance, having a gooselike body mounted upon long legs and surmounted by an extremely long and flexible neck, terminated by a huge beak of very unusual shape. (See Colored Plate of Wading Birds.) Six or eight species or forms are recognized, forming the family Phœnicopteridæ, all more or less rose red in color and inhabiting the warmer parts of the world. They gather in flocks upon marshes and river banks, and in migration fly like geese, in long strings, or a wedge formation, their legs trailing behind and their necks stretched straight out ahead. The great length of the neck is due not to an extraordinary number (18) of bones, but to the unusual length of each vertebra. Measured from beak to toes, their matured length may exceed six feet, but as the legs, which are naked far up to the thigh, are only about two feet long, and the body is small, the apparent size is much less.



BEAK OF AMERICAN FLAMINGO.

The food of these quaint birds is derived from the water and mud, and in seeking it they wade about in shallow places, supported upon the soft mud by their great webbed feet, which are kept in motion to disturb the bottom and stir out its lurking contents. The bill is large, deeper than broad, and suddenly curved downward near the middle, so that, as the bird wades and seeks its food, either in the water or in the mud, it makes use of the bill in a reversed position, the upper mandible being lowest. The edges of both mandibles are furnished with small and very fine transverse laminæ, which serve, like those in the bills of the ordinary marsh duck, to prevent the escape of the small crustaceans, mollusks, worms, small fishes, seeds, etc., which are the flamingo's food, and to separate them from the mud with which they may be mingled. The upper surface of the tongue is also furnished on both sides and at the base with numerous small flexible horny spines, directed backward. Flamingos make their nests gregariously in marshes, scraping up a heap of mud, the top of which is hollowed out and contains one or two white eggs. Many fables remain in the old books as to these nests, but the truth is that the heaps of mud are only of such a height as will lift the eggs well above the surrounding water, and that the female sits with her legs folded comfortably beside her. Their favorite breeding places are salt lakes and marshes, such as the broad *marasmas* of Spain and the great Atacama saline marshes in South America.

The flamingo of the Mediterranean region (*Phœnicopterus antiquorum*) ranges far eastward and southward, and the three other species, so called, of southern Africa and southeastern Asia, may prove to be mere varieties of it. A species is peculiar to Chile, and another (distinguished by the absence of a back toe) to the elevated desert of Atacama, on the border of Chile and Bolivia. The North American flamingo (*Phœnicopterus ruber*), once common in all the southern United States, but now grown very rare north of the Bahamas, West Indies, and Central America, is remarkable for the deep vermilion color of its plumage, set off by black wing quills, which has made it too attractive to sportsmen and plume hunters. The males show the brightest plumage, the young being brown and the females pale pink.

The classification of these birds has been a puzzle to ornithologists, but they are now regarded as a family representing a distinct order (Odontoglossæ or Phœnicopteriformes) usually ranked as intermediate between the anserine birds and the spoonbills, ibises, etc. Consult: Newton, *Dictionary of Birds* (New York, 1893–96); Cory, *Birds of the Bahamas* (Boston, 1880); A. Chapman, *Wild Spain* (London, 1893); F. M. Chapman, *Camps and Cruises of an Ornithologist* (New York, 1908).

FLAMINGO FLOWER. See Arum, and Plate of Anemone.

FLAMIN'IAN WAY (Lat. *Via Flaminia*). The great northern road of ancient Italy, leading from Rome to Ariminum (Rimini) on the Adriatic. It was constructed by C. Flaminius during his censorship (220 B.C.) and was designed to secure a free communication with the recently conquered Gallic territory. The Flaminian Way was one of the most celebrated and most frequented roads of Italy during the period of the Republic and also of the Empire. Leaving Rome by the Porta Flaminia (near the modern Porta del Popolo), it crossed the Tiber at the famous Milvian Bridge (*Ponte Molle*) and ran nearly due north, crossing the river again near Borghetto, till it reached Narnia (Narni). At this point the original road continued to the northeast by way of Mevania (Bevagna) to Forum Flaminii. A branch was later built to the east, passing through Interamna (Terni) and Spoletium (Spoleto), and meeting the main road at Fulginium (Foligno), south of Forum Flaminii. From this point the road ran north and northeast through the Apennines till it reached the Adriatic at Fanum Fortunæ (Fano), where it followed the coast line to Ariminum (Rimini), where it ended, or rather where the name ceased; for the Via Æmilia (see Æmilian Way; Emilia) was a continuation of it. The whole length of the road from Rome to Ariminum was, according to the Jerusalem itinerary, 222 miles and, according to the Antonine, 210 miles. The road was kept in good repair, especially by Augustus and Trajan. Important remains of this road—pieces of the pavement and arches of bridges—still exist at various places.

FLAM'INI'NUS. A cognomen of an illustrious branch of the patrician Quinctia gens in ancient Rome, the most famous members of which were: 1. Lucius Quinctius Flamininus (?–170 B.C.). Admiral and general, brother of the more renowned Titus Quinctius Flamininus described below. He was curule ædile in 200 B.C. and prætor in 199. In the war conducted by Titus Flamininus against Philip, King of Macedon, in 198, Lucius commanded the Roman fleet, with which he sailed around Greece and, joined by the fleets of Attalus, King of Pergamus, and the Rhodians, laid siege to the city of Eretria in Eubœa, which was defended by a Macedonian garrison. He soon gained possession of all Eubœa and then returned to the west coast of Greece and laid siege to Cenchreæ, the harbor of Corinth; but Corinth itself he was unable to capture. (See MUMMIUS.) In 192 Flamininus was consul with L. Domitius Ahenobarbus. At the end of his year he set out for Gaul as proconsul, ravaging the country of the hostile Ligurians and Boii on his way and inflicting crushing defeats. His moral conduct at this period disgraced both the man and the high office he held; and several years later, in 184 B.C., the censor, M. Porcius Cato, arraigned him before the Senate in a most bitter speech and expelled him from that body. He died in 170 B.C. 2. TITUS QUINCTIUS FLAMININUS (c. 230–175 B.C.). Brother of the preceding. He was a statesman and general, and the hero of the wars against Philip and Antiochus. He was quæstor in 199 B.C., and consul in 198, without holding the intermediate offices of ædile and prætor. He obtained Macedonia as his field of operations and set sail from Italy for Greece with a small army of veteran troops. He made Epirus his base and waited patiently for an opportunity of crossing the mountains and invading Macedonia. When at length, through the help of a friendly Epirote, the opportunity came, he entered Macedonia and attacked Philip's army in the rear, massacring 2000 men and driving the rest in the direction of Thessaly. Thessaly next was overrun, and then, making a long detour to the south, he took the towns of Phocis. At the same time his brother Lucius (see above), in command of the fleet, had induced the Achæan League to take sides with the Romans. Thus the year of Flamininus' consulship had brought great advantages to the Roman cause and weakened greatly Philip's prestige in Greece. Flamininus was thus enabled to demand, as a price of truce, that the Macedonian garrisons be withdrawn from the whole of Greece. This price Philip was unwilling to pay. A double commission, accordingly, was sent to Rome, with envoys from Philip and from Flamininus; but the Senate decided to prolong the latter's *imperium* and gave notice to the former that the Roman general had full authority to prosecute the war to the end. Thus began the second year of the struggle (197 B.C.), which very soon decided the fate of the Macedonian King. The opposing armies met at Cynocephalæ, and the rout of Philip's army was complete. Yet Flamininus would not accede to the demands of his allies that Philip should be dethroned and his kingdom broken up. He contented himself with depriving him of all his possessions in Greece and Asia and left Macedonia intact. Soon after this he won the enthusiastic applause of the Greeks by declaring, at the Isthmian Games, in the presence of delegates from all of the Greek states, the freedom and independence of all the towns that had been under Macedonian rule. The complete independence of the Greeks was menaced by Nabis, Tyrant of Sparta, who had been allied with the Romans against Philip; Flamininus therefore brought force to bear upon Nabis and compelled him to desist from offensive tyranny. In short, when he took his departure from Greece in the spring of 194 B.C., there was no better loved man in all the country than Flamininus "The Liberator." In 192 a new trouble broke out in the East, and Flamininus returned to Greece. Antiochus, King of Syria, and Nabis, Tyrant of Sparta, were allied against the Romans, but this difficulty was again smoothed over by the tact of the Roman general. When he again returned to Rome, he was made censor, in 191 B.C. We last hear of him as Ambassador to Prusias, King of Bithynia, in 183 B.C., when the aged Hannibal (q.v.) was driven to commit suicide for fear of being delivered to the Romans. In 174 B.C. funeral games in honor of Flamininus were celebrated by his son; from this it has been supposed that he died early in this or late in the preceding year. Flamininus was a man of great ability, of consummate tact and a skillful diplomat, warmly devoted to Greek culture, and an ardent supporter of a policy for Rome of Imperialistic Expansion. An instance of his self-control is the story that, when the Achæans sought to honor him before his return to Rome, he asked only that they should redeem the Italians who had been sold into slavery in Greece during the war with Hannibal; 1200 such Italians he brought back with him to Rome. His life was written by Plutarch. On both the Flaminini, consult Niese, *Geschichte der griechischen und makedonischen Staaten seit der Schlacht bei Chäronea*, vol. ii (Gotha, 1893–1903).

FLAMINIO, flä-mē'nē-ō, MARCANTONIO (1498–1550). An Italian poet, son of Giannantonio Zarabbini di Cotignola, professor at Serravalle (1516–36), who took the name Flaminio. In 1545 he refused the post of Latin secretary at the Council of Trent, where he appeared as a member of the conservative reform group, having been previously associated with Valdès, Reginald Pole, and other radicals. His complete works, with his father's poems, were published at Padua (1743); they include some lyrics, which are, if anything, superior to the average of Petrarchistic production, a poetical version of 30 psalms, prose versions of all the psalms and of the twelfth book of Aristotle's *Metaphysics*, and an Italian grammar, *Compendio della volgar grammatica*. Consult Cuccoli, *Marcantonio Flaminio* (Bologna, 1897).

FLAMIN'IUS, GAIUS (?–217 B.C.). A Roman general, renowned in the Gallic and Hannibalic wars and as builder of the Via Flaminia and of the Circus Flaminius at Rome. Descended from high plebeian stock, he was the most illustrious member of his family. We first hear of him as tribune of the people (*tribunus plebis*), in 232 B.C., when his energies were wholly employed in opposition to the Senatorial, or Conservative party. He proposed and carried an agrarian law for the division among the plebeians of the lands of Picenum and of the Senonian Gauls. (See AGRARIAN LAWS.) This tract, of great extent, south of Ariminum, had lately been won by force of arms. As prætor in 227, he received the government of the Province of Sicily, which he administered well. In 223 he was consul with P. Furius Philus and took the field against the Gauls of northern Italy, who, frightened at the above-mentioned division of Gallic lands and fearing similar attempts on their own territories, had broken into hostilities against Rome. As soon as Flaminius with his army left the city, his political enemies set about to secure the annulment of his election on religious grounds. Just as the consuls were preparing battle with the Insubrian Gauls a dispatch arrived from Rome with orders to return at once; but it was not opened until Flaminius had gained a signal victory on the banks of the Adda. Upon learning the purport of the dispatch Furius at once left the field; but Flaminius refused to obey until he brought the campaign to a successful ending. He was summoned before the Senate to answer for his disobedience, but the admiring populace accorded him a triumph. In 221 he was *magister equitum* to the dictator, M. Minucius Rufus; but, owing to an unfavorable omen, both were soon forced to abdicate. In 220 he was censor with L. Æmilius Papus and constructed the great highway from Rome to Ariminum, on the Adriatic Sea, called after him Flaminia Via. In 218 he gained the further enmity of the Conservatives by supporting a proposal of Q. Claudius that senators and senators' sons should not possess seagoing vessels except for the transportation of the produce of their own estates. Elected consul again for the year 217, he took command of the army to check the advance of Hannibal, and in his haste to leave the city he neglected to observe the customary religious formalities. In order to block Hannibal's march he led his troops from Ariminum (Rimini) to Arretium (Arezzo), but was caught unprepared on the shores of Lake Trasimenus and was killed in a three hours' battle, in which 15,000 of his troops perished. The extant accounts of Flaminius (consult especially Livy, xxi–xxii, Polybius, ii–iii) are prejudiced; they go back to patrician sources. Consult "Flaminius," in Lübker, *Reallexikon* (8th ed., Leipzig, 1914).

FLAMM, flȧm, ALBERT (1823–1906). A German landscape painter, born at Cologne. He was a pupil of Andreas Achenbach at Düsseldorf, where he settled after traveling in Italy. His pictures, the subjects of which are chosen almost exclusively from Italian scenery, command attention by their truthfulness to nature, careful execution, and bright and varied effects of color. One of his best productions is the "Approaching Storm in the Campagna" (1862). Among others may be mentioned "Via Appia," in the Kunsthalle at Hamburg, a fine "Italian Landscape" (1856), in the Ravené Gallery, Berlin, and "View of Cumæ" (1881), in the National Gallery in Berlin. In 1900 the title of professor was conferred upon him.

FLAMMARION, flȧ′mȧ′rē′ôɴ′, CAMILLE (1842–1925). A French astronomer, born at Montigny-le-Roi, Haute-Marne. He is best known as a writer of popular scientific books, among which may be mentioned: *La pluralité des mondes habités* (1862; 34th ed., 1890); *Les merveilles célestes* (1866); *L'Atmosphère* (1872; new ed., 1887); *Le monde avant la création de l'homme* (1884); *Uranie* (1889); *La planète Mars et ses conditions d'habitabilité* (1892); *La fin du monde* (1894); and several astronomical and spiritistic romances, and essays, of which *L'inconnu et les problèmes psychiques*, translated into English under the title *The Unknown and Psychic Problems* (1904), is typical. His combination of mysticism and science results from early theological studies at Langres and Paris. He wrote also *Astronomy for Amateurs* (1904); *Thunder and Lightning* (1906); *Mysterious Psychic Forces* (1907); He became editor of a popular scientific magazine, *Cosmos*, in 1863 and in 1865 scientific editor of a newspaper, *Le Siècle*. There is a *Life*, by S. Hugo (Paris, 1891). He became editor of *L'Astronomie*, a monthly review which he founded in 1882, and of *L'Annuaire astronomique et météorologique*. In 1887 he founded the Astronomical Society of France and was elected its first president. Among his more solid contributions to astronomical science may be mentioned his work on double and multiple stars, the topography and physical constitution of Mars and the moon, and the proper motions of the stars.

FLAMMBURG, flȧm′bụrk, GOTTFRIED. See EBRARD, JOHANNES HEINRICH AUGUST.

FLAMMERMONT, flȧ′mȧr′môɴ′, JULES GUSTAVE (1852–99). A French educator and historian, born at Clermont (Oise). In 1886 he became professor of history and of the geography of antiquity and of the Middle Ages in the faculty of letters at Poitiers, and subsequently was called to a similar chair at Lille. His publications include: *Le chancelier Maupeou et les parlements* (1884; crowned by the Academy); *Etudes critiques sur les sources de l'histoire au XVIII siècle* (1886); *Lille et le Nord au moyen âge* (1888); *Mémoires sur les grèves et les coalitions ouvrières à la fin de l'ancien régime* (1895); *Album paléographique du nord de la France* (1897).

FLAM′MOCK'S REBELLION. An outbreak which occurred early in June, 1497, in Cornwall, England, in opposition to the levying of a tax to defray the expenses of the war against Scotland. It was led by one Thomas Flammock and took the form of a march against London. The insurgents were defeated on Blackheath on the seventeenth of the month, and the leaders were summarily executed.

FLAM′STEED, JOHN (1646–1719). The first astronomer royal of England, born at Denby, near Derby. While yet a youth, he mastered the theory of the calculation of eclipses. His calculations were the means of introducing him to the notice of the eminent scientific men of his time, such as Halley and Newton, through whom he was appointed astronomer to King Charles II in 1675. The year following the observatory at Greenwich was built for his use, and he began that series of observations that marked the commencement of modern practical astronomy. He formed a catalogue of the fixed stars and furnished the lunar observations on which Newton depended for the verification of his lunar theory. His last years were embittered by disputes with Newton and Halley concerning the publication of his observations. His great work, *Historia Cœlestis Britannica*, in 3 vols., giving an account of the methods and results of astronomical observation up to his time, was not published till 1725. Consult Baily, *Account of the Rev. John Flamsteed* (London, 1835).

FLAN′AGAN, JOHN (1865–). An American sculptor, born at Newark, N. J. He studied in Boston under Bartlett, in New York under Saint-Gaudens, and in Paris under Chapu and Falguière. He succeeded especially well in relief work, for which he received silver medals at the Paris Exposition of 1900, at Buffalo in 1901, and at St. Louis in 1904. His principal works include an elaborate clock in the Congressional Library, Washington; a bronze relief in the Newark Public Library; the "Birth of Aphrodite" in the Knickerbocker Hotel, New York; four panels in the Chicago City Hall; and three reliefs for the interior of the Scroll and Key Society building, Yale University. He is also represented in the Metropolitan Museum, New York, and the Luxembourg Museum, Paris.

FLAN′AGAN, RODERICK (1828–61). An Australian journalist, born in Ireland, but taken by his parents to Sydney at the age of 12. He learned his trade in a printing office; was a reporter for the daily papers; and started with his brother a short-lived weekly, the *Chronicle*, which later became the *Empire*, and of which latter paper he became editor in chief. The *Empire* was notable for its advocacy of better treatment of the Australian aborigines. By 1854 he was on the staff of the Sydney *Morning Herald*, but labored so hard at his *History of New South Wales* that he died from overwork while in London preparing it for publication. The book was issued (1862) after his death.

FLANCH'ES, or **FLANQUES**, flănk. See HERALDRY.

FLAN'DERS (Flem. *Vlaenderen*, anciently *Vlaeland*, submerged land). The old name of an extensive region embracing, besides the present Belgian provinces of East and West Flanders, the southern portion of the Province of Zealand, in Holland, and the French Department of Le Nord, and constituting in the Middle Ages a powerful and almost independent principality, ruled by counts under the suzerainty of the French King. Under the Franks the river Scheldt, which flowed through the district, formed the boundary line between Neustria and Austrasia, in consequence of which the northern and southwestern parts of the territory comprised under the term "Flanders," although its population was decidedly Germanic, came to belong to France, while the southeast, although to a large extent non-Germanic, was after 1007 included in the Holy Roman Empire. Flanders obtained its name from the *Vländergau* (*pagus Flendrensis*), the district around Bruges and Sluis, whose counts had been made wardens of the northern coasts of France at the period of the incursions of the Northmen, in the latter half of the ninth century, and who extended the name of their hereditary possessions to the whole district which they governed. The first Count, or Margrave, of the country is said to have been Baldwin, surnamed Bras de Fer (Iron-Arm), who married Judith, the daughter of Charles the Bald of France and widow of Ethelwulf, King of England, and received the newly created "mark," or county, as a hereditary fief from his father-in-law in 864. Baldwin died about 878. He is said to have inaugurated the industrial greatness of Flanders by introducing into the country great numbers of workmen skilled in the manufacture of woolen and other goods. Baldwin IV with the Beard, one of the successors of Baldwin Bras de Fer, received in fee from the Emperor Henry II the burgraviate of Ghent, Walcheren, and the island of Zealand, and thus became a prince of the Empire. He was succeeded by his son, Baldwin V, or the Pious (1036–67), who increased his possessions by the addition of the German territory between the Scheldt and the Dender, belonging to the Duchy of Lower Lorraine. To this be added Tournai, the supremacy over the bishopric of Cambrai (to which, till the erection of the new bishopric of Arras, the County of Flanders had been ecclesiastically subordinate), and the County of Hainaut. During the Middle Ages Flanders figured prominently in the political affairs of Europe—the counts of Flanders being more powerful and wealthy than many European kings. Baldwin IX, the founder of the Latin Empire at Constantinople (see BALDWIN I), died in 1206, leaving two daughters, one of whom died without children; the other bequeathed Hainaut to John of Avesnes, her son by her first marriage, and Flanders to Guy of Dampierre, her son by a second marriage. Meanwhile the industrial prosperity of Bruges, Ghent, and other cities of Flanders had become so great that the citizens began to feel their own power and to claim independence. They formed republican communities like the free cities of Germany, with this difference, that they admitted the nominal suzerainty of the counts. But they were not afraid to take up arms in defense of their liberties against their nominal masters. Their resistance to arbitrary power took the form of opposition both to the counts of Flanders as their immediate lords (see ARTEVELDE, JACOB VAN), and sometimes, in conjunction with their counts, to the encroachment of the French King. In 1214 Philip Augustus of France gained a decisive victory at Bouvines (q.v.) over the united forces of John of England, the Count of Flanders, and Otho IV of Germany. In 1302 a force of 20,000 pikemen under Guy of Dampierre inflicted a crushing defeat at Courtrai on an army of 50,000 French knights, archers, and foot soldiers. It was largely at the instigation of the Flemings that Edward III of England assumed the title of King of France and invaded that country, marking the beginning of the Hundred Years' War (q.v.). Through the marriage of Margaret, the daughter and heiress of Louis II, Count of Flanders, to Philip the Bold of Burgundy in 1369, the country was united to the Burgundian's territories (1384) and afterward shared the fortunes of that duchy. The dukes of Burgundy brought a greater part of the former Duchy of Lower Lorraine under their domain and thus laid the foundation for the subsequent union of the States of the Netherlands, in which Flanders continued to form an important part. Under this dynasty Flanders prospered, and the arts were greatly encouraged. On the death of Charles the Bold the Netherlands, which constituted the most flourishing and opulent realm in Europe, passed in 1477 to the house of Hapsburg, by the marriage of his daughter Mary to the Archduke Maximilian. After the Netherlands had passed with King Philip II to the Spanish line of the house of Hapsburg, the territory of Flanders was considerably diminished; the portion called Dutch Flanders was transferred to the States-General by the Peace of Westphalia, and in the time of Louis XIV France seized upon other portions of Flanders and was confirmed in her possession by the treaties of Aix-la-Chapelle (1668), Nimwegen (1678), and Utrecht (1713). By the last, and by the treaty of peace concluded at Rastadt (1714), what remained of the Spanish Netherlands again fell into the hands of the house of Austria. In 1795 Flanders, like the other provinces of Belgium, was incorporated with the French Republic and afterward formed part of the Empire, as the departments of Lys and Escaut (Scheldt). The Congress of Vienna united Belgium with Holland to form the Kingdom of the Netherlands. In 1830–32 Belgium liberated itself from Holland. Consult Le Glay, *Histoire des comtes de Flandre jusqu'à l'avènement de la maison de Bourgogne* (Brussels, 1853), and Kervyn de Lettenhove, *Histoire de Flandre* (4 vols., 5th ed., Bruges, 1898). See FLEMISH LANGUAGE AND LITERATURE.

FLANDERS, EAST. A province in the northwest of Belgium, the eastern part of the former County of Flanders (q.v.) (Map: Netherlands, B 4). Area, 1172 square miles. The surface is low and level and watered mainly by the

Scheldt and by its affluents, the Lys and the Dender. Part of the province in Waes is below sea level and has been reclaimed. The soil has been rendered extremely fertile by careful and systematic cultivation. Grain, potatoes, flax, hemp, and hops are produced in great quantities. The district in the northeast of the province, between the towns of Antwerp and Ghent, is celebrated as a flax-growing section. The province is one of the principal centres of the linen-weaving and flax-spinning industries and has also numerous tanneries, besides paper, woolen, and lace mills. The chief exports are lace, linen, and agricultural and animal products. Pop., 1900, 1,029,971; 1913, 1,134,079. Chief towns, Ghent (the capital), Aalst, and Dendermonde.

FLANDERS, Henry (1826–1911). An American lawyer and writer, born in Plainfield, Sullivan Co., N. H. He was educated at Kimball Academy and at the Newbury (Vt.) Seminary, studied law, and after 1850 practiced at Philadelphia. He is best known as the author of *Lives and Times of the Chief Justices of the Supreme Court* (2 vols., 1855–58; last ed., 1881), which contains excellent biographical sketches of Jay, Rutledge, Cushing, Ellsworth, and Marshall, and has long been a standard work. Among his other publications are: *A Treatise on Maritime Law* (1852); *a Treatise on the Law of Shipping* (1853); *An Exposition of the Constitution of the United States* (1860); a *Treatise on the Principles of Insurance* (1871); *Memoirs of Richard Cumberland* (1856); *Life of John Marshall* (1905).

FLANDERS, Moll. A profligate woman, the subject of De Foe's *Fortunes of Moll Flanders.*

FLANDERS, West. The westernmost province of Belgium, bordered on the northwest by the North Sea (Map: Belgium, A 4). It has an area of 1249 square miles. In general its surface is flat, low, and in parts marshy. There are sandy hills in the south and dunes along the coast. The Yzer and the Lys are the principal rivers. Numerous canals traverse the province. Agriculture, and particularly stock raising, flourish remarkably under a system of intensive agriculture. The manufactures are chiefly linens and laces. Nearly 40 per cent of the population are engaged in manufacturing. The capital is Bruges. Other important towns are Courtrai, Roulers, Ypres, and Ostend. Pop., 1900, 805,236; 1913, 884,777.

FLANDIN, flăɴ'dăɴ', Charles (1803–91). A French chemist, born at Aubues. In 1829 he was *interne* in Paris and three years afterward published his remarkable work on cholera. From that time he was best known as a toxicologist. His most important works are *De l'arsenic* (1841) and *Traité des poisons* (1846–53). His discoveries in regard to the action of sulphuric acid in carbonizing organic substances led him into a long and bitter polemic with Orfila.

FLANDIN, Eugène Napoléon (1809–76). A French painter and archæologist. He was born in Naples and studied in Paris under Horace Vernet. After painting several fairly successful pictures he served in the Algerian campaign and was afterward sent on an archæological mission to Persia, with the architect Pascal Coste, and stayed in that country from 1839 to 1841. The valuable discoveries made there he published in a *Voyage en Perse* (1843–54; 6 vols., 665 plates). He also designed the plates for Botta's work on Nineveh and Khorsabad, and himself published *Le monument de Ninive* (5 vols., 400 plates, 1847–50); *L'Orient* (1853–74); *Histoire des chevaliers de Rhodes* (1864–73). He is known chiefly for his valuable discoveries in history and archæology. Among his paintings are: "Entrance of the French Army into Algiers" (Versailles Museum); "View of Bagdad" (Marseilles); "View of Athens" (Rouen).

FLANDRIN, flăɴ'drăɴ', Hippolyte (Jean) (1809–64). A French painter, one of the greatest religious decorators of the nineteenth century. He was born at Lyons, the second son of a miniature painter, and was taught by his father and in the art schools of Lyons. In 1829 he went to Paris on foot, with his brother Paul, and entered the atelier of Ingres and the Ecole des Beaux-Arts. During all their student days the brothers lived in distress and poverty. In 1832 Hippolyte won the Grand Prix de Rome, and thereupon studied five years in the Eternal City. Some of the pictures painted at this time are among Flandrin's most interesting compositions. The picture of "Dante and Vergil" (Lyons Museum) won a medal in the Salon of 1836, and "St. Clara Healing the Blind" (cathedral of Nantes), a gold medal in 1837. Soon after he settled in Rome Flandrin devoted himself definitely to religious painting. In 1839 he returned to Paris. In 1840 he received a commission for the decoration of the chapel of St. John in the church of Saint-Severin in Paris. The success of this work brought the very important commission for the decoration of the famous old church of Saint-Germain-des-Prés in Paris, which had been recently restored. He painted two of his best compositions, the "Entrance into Jerusalem" and the "Procession to Calvary," on the walls of the church. In 1846 he was further commissioned to paint the choir of this church. Flandrin decorated also the new church of St. Paul in Nîmes (1848–49) and the three apses of the church of the abbey of Ainay in Lyons.

In 1849 he received the commission for his most important work, the decoration of the great church of St. Vincent de Paul, built by the architect Hittorff in Paris. The work was at first offered to Ingres and afterward to Paul Delaroche. Refused by both, the commission was finally given to Flandrin and executed by him in 1850–54. The long frieze between the two superimposed arches, representing a procession of saints, is his chief work and one of the finest things in modern figure decoration. Induced by failing health to revisit Italy, he died of smallpox at Rome, March 1, 1864. At the time of his death Flandrin had projected decorations for the cathedral of Strassburg, and for the church of Saint-Augustin in Paris. Flandrin is the greatest religious painter of modern France, depicting the ideal conceptions of a primitive faith with the power of a finished art. Austere and cold in color, his paintings are excellent in draftsmanship and firm in execution. The effect of detail is always sacrificed to the majesty of the whole. He also painted numerous portraits of the notable men and women of his day, including Napoleon III (Versailles Museum), Prince Jerome Napoleon, Duchâtel, Madame Vinet (Louvre), and Mademoiselle Maison, known as "La jeune fille a l'œillet." He is, however, too reserved and lacking in animation to be a great portraitist. He was made officer of the Legion of Honor and member of the Academy in 1853 and professor of painting in the Academy. His correspondence was published after his death by Delaborde, under the title *Lettres et pensées d'Hippolyte Flandrin* (Paris, 1865).

August (1804–42), the elder brother of Hippolyte, studied at the Ecole des Beaux-Arts in Lyons and became a lithographer. In 1832 he joined his brothers in the atelier of Ingres in Paris and visited Italy. Returning to Lyons, he opened a studio where he taught the doctrines of Ingres with much success.

Jean Paul (1811–1902), the younger brother of Hippolyte, studied at the Ecole des Beaux-Arts in Lyons, accompanied his brother to Paris, studied with Ingres, and went to Rome in 1834. He exhibited at the Salon frequently and won several medals, but spent most of his life as the assistant of his brother Hippolyte. After the latter's death he finished the decorations of the nave of the church of Saint-Germain-des-Prés from his designs. He was employed independently in the church of Saint-Séverin and the Palais de la Chancellerie. Paul persisted all his life in the classical tradition. He painted many landscapes, which are sincere and often full of charm. One of the best, "Solitude," is in the Luxembourg.

Consult: Saglio, in *Gazette des Beaux-Arts* (Paris, 1864); Arlich, in *Fine Arts Quarterly Review*, vol. v (London, 1866); Poncet, *Hippolyte Flandrin* (Paris, 1864); Clément, *Etudes sur les beaux-arts en France* (ib., 1865); Blanc, *Les artistes de mon temps* (ib., 1876); Lear, *A Christian Painter of the Nineteenth Century* (London, 1875); Beulé, *Notice historique sur la vie et les ouvrages de M. H. Flandrin* (Paris, 1869); Flandrin, *Hippolyte Flandrin: Sa vie et son œuvre* (ib., 1902).

FLANGE (later form of *flanch*, from *flank*, OF., Fr. *flanc*, ML. *flancus*, flank, from OHG. *hlanca*, flank, dialectic Eng. *lank*, groin). A projecting rim, rib, or ridge, on any object, as the ridge on the inner edge of a car wheel or the rim on the end of a cast-iron pipe. A railway rail is made up of a head, a web, and a base, and the base may be considered as formed by two flanges; a steel I-beam has a vertical web and a horizontal top and bottom double flange. Flanges are employed on a multitude of objects, of which those named are merely familiar examples. Joints in piping of the larger sizes are usually made by bolting together the opposing faces of two flanges, with a compressible flat disk of some softer metal or manufactured substance to make the joint tight against leakage of the fluid which the pipe is conveying. These flanges may be disks into which the end of the pipe is secured by screwing or expanding the metal; or in work of the highest class the flange is formed upon the end of the pipe without a joint. The bolts must draw the faces of the flanges together both so as to make the joint tight and also to resist the end thrust of any pressure within the pipe. See the article Railways.

FLANK (OF., Fr. *flanc*, flank). In military formations, a wing or extremity. Flank files, companies, battalions, or regiments are the troops on the right and left extremities of the main body. The flank is a source of weakness to the front in proportion to its length and vulnerability; and of strength if protected by the natural conformation of the terrain, in that it releases a larger force for the front, or wherever the danger threatens. A *flanking* or *enveloping attack*, owing to the danger and cost of frontal attack, is now a movement of supreme importance. It consists in massing superior forces against the enemy's flank, meanwhile occupying his attention in front. A *turning movement* is usually understood to mean a wider flank march of a large body of troops having in view an attack against the enemy's flank. See Attack; Tactics, Military.

FLAN'NEL (OF. *flanelle*, of doubtful origin, possibly connected with OF. *flaine*, pillow case, which seems to be derived from the Celtic; Ir. *olann*, wool, Welsh *gwlân*, Corn. *gluan*, Bret. *gloan*, linen, Lat. *lana*, Eng. *wool;* with Fr. *fl* for Celt. *vl*, as in Fr. *flèche*, arrow, from Ir. *flesc*). A woven fabric used chiefly for underclothing and other garments. Flannels are usually made of wool, with which may be combined or woven silk, linen, cotton, or worsted yarns. They are dyed in all shades of solid colors, and many are printed or embroidered with various designs and patterns. Vegetable or chemical coloring agents are largely used for dyeing. All-wool flannels, which were used years ago by working people, have not been manufactured recently so extensively, owing to the cheaper and more attractive fabrics produced by the admixture or use of cotton, although all-wool blue flannels are still used largely by firemen, miners, sailors, and laborers. Flannels have suffered through the increased use of knitted garments, such as the so-called "sweater," and various forms of knitted articles of apparel for underwear which are used to their exclusion. French flannels are made of wool and worsted, or wool with silk warps in various grades, and are extensively used for women's garments. Canton flannels, so called, although made entirely of cotton, have the face of the goods carefully napped or teazled. The fibres are fulled or felted and combed out so as to make a soft and fleecy surface. Outing flannels are loosely woven fabrics of cotton which have been manufactured within the past 30 years and have a napped face and are made in many designs with attractive colorings. Domett flannels are made with cotton warp and woolen filling, being manufactured in both plain and fancy colorings, in many instances the yarns being dyed before weaving.

For detailed description of manufacture of flannels and other fabrics, see Wool and Worsted Manufactures.

FLAN'NELMOUTH. A local name in the United States for (1) the great fork-tailed catfish (*Amiurus lacustris*) of the Mississippi valley; and (2) a sucker (*Catostomus latipinnis*) of the Rio Colorado and its tributaries.

FLASSAN, flȧ'säN', Jean-Baptiste Gaëtan Raxis de (1760–1845). A French diplomat and historian, born at Bedouin (Vaucluse) and educated in Paris. He became professor of history at the military Academy at Saint-Germain in 1812, was historiographer of the Ministry of Foreign Affairs until 1829, and was present at the Congress of Vienna, of which he wrote a history (2 vols., 1829). His principal work is the *Histoire générale de la diplomatie française depuis la fondation de la monarchie jusqu'au 10 Août 1792* (7 vols., 1811), and he wrote on contemporary diplomatic history.

FLAT (Icel. *flatr*, OHG. *flaz*, flat). A musical character, shaped thus, ♭, which, when placed before a note, lowers that note half a tone. If this note, or its octave, occurs more than once within the same bar, it is always played flat, although not again marked. When the original natural tone is to be played again in the following bar, it is customary to mark it with a natural (♮). The *double flat* (♭♭) lowers a note two chromatic half tones.

FLAT. A suite of rooms on one floor containing all the requirements of a dwelling, in a building of several stories; an apartment in an apartment house. A "single" flat is one in a house having but one such suite to a floor; a "double" flat, one of two suites to a floor. This system has long been in use in Europe and particularly on the Continent, but recently has been more commonly adopted in England and America. In some American cities, especially New York, local usage distinguishes a "flat" as an apartment of the cheaper sort, in which there is no elevator or restaurant and usually no hall attendance. See Apartment House.

FLATEYJARBOK, flät′ē-yär-bŏk (Icel., book of Flatey). A collection of sagas connected with the times of the Norwegian kings Olaf Tryggvasson and Olaf the Saint, once owned in the Icelandic island of Flatey, now in the Royal Library in Copenhagen. It is the work of two Icelandic priests (1380–95) and is one of the chief sources for the Norse discovery of America.

FLATFISH. A general name for a large and important group of marine acanthopterygious fishes constituting the suborder Heterosomata, and embracing the families Pleuronectidæ (flounders) and Soleidæ (soles). They have much compressed bodies, swim upon their sides, near the bottom, and all have the fore part of the skull twisted so as to allow of two eye orbits on the same side, one vertical and one lateral. See Flounder; Sole; Turbot; etc.

FLATFOOT; Pes Planus. A depression of the inner half of the plantar arch, while the sole is not everted, caused by excessive weight, bone defect, or weakened ligaments. Certain occupations which require prolonged standing are prone to result in flatfoot. Waiters and cooks are especially affected. The remedy consists in forcing the bones into place, strapping with adhesive plaster, and wearing specially constructed shoes. See Clubfoot.

FLATHE, flä′*te*, Heinrich Theodor (1827–1900). A German historian, born June 1, 1827, at Tanneberg in Saxony. He studied philology and history in the University of Leipzig and in 1866 became a professor in the Fürstenschule at Meissen. He retired from active life in 1895 and died March 26, 1900. Flathe was an indefatigable writer and editor, his special field being Saxon and modern history. He published numerous monographs in Weber's *Archiv für sächsische Geschichte.* He prepared for the Heeren and Ukert series a new edition of C. W. Böttiger's *Geschichte des Kurstaates und Königreichs Sachsen* (1867–73). His own writings include: a history of the Fürstenschule at Meissen (1879); *Katechismus der allgemeinen Weltgeschichte* (1884); *Das Zeitalter der Restauration und Revolution, 1815–51*, in the well-known Oncken series (1883); *Deutsche Reden, Denkmäler zur vaterländischen Geschichte des 19ten Jahrhunderts* (1893–94); and contributions, in three volumes, under the title *Die neueste Zeit* (1887–92), to the *Allgemeine Weltgeschichte*, by Flathe, Hertzberg, and others. This work, covering the period from 1789 to 1887, has appeared in an English translation in four volumes, comprising vols. xvi–xix in the "History of All Nations Series" (Philadelphia, 1902).

FLATHEAD. A fish, the barramunda (q.v.).

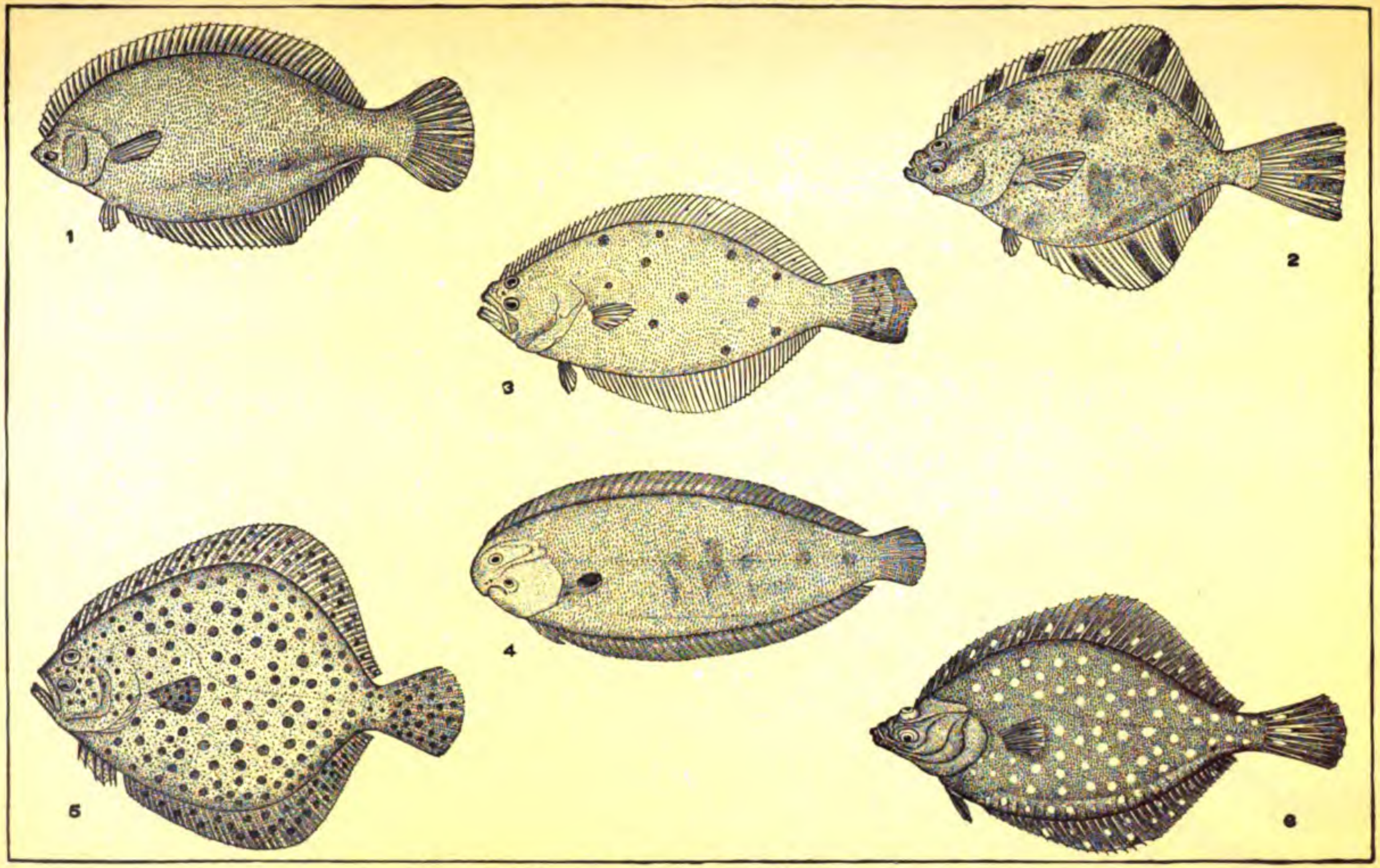
FLATHEAD, or Salish. An important Salishan tribe, and the one from which the stock takes its name, formerly holding the mountain region of northwestern Montana and centring about the lake and river of that name. Among the early explorers and traders they were noted for their friendly and honorable character, and because, while not aggressive, they bravely defended themselves against the inroads of their enemies, the Blackfeet. Singularly enough, they never had the custom of flattening the head, as their popular designation would imply, the name arising from the fact that the more western tribes on the Columbia, which practiced this custom almost universally, considered themselves in consequence as having *pointed* heads, and therefore distinguished the Salish, whose skulls were not thus deformed, as "flatheads." The Jesuit missionary De Smet began work among them in 1841, founding the mission of St. Mary, long known as the most successful Indian mission in the Northwest. Together with the confederated Pend d'Oreille and a band of Kutenai Indians they are now gathered upon the Jocko reservation within their ancient territory, the combined tribes numbering 1588. See Salishan Stock.

FLATMAN, Thomas (1637–88). An English poet and miniature painter, born in London. He was educated at Winchester and Oxford and was admitted to the bar, but gave up law to follow art and literature. His *Poems and Songs* (1674, 1686) were well received, but have been unfairly depreciated by later critics. His miniatures, which Vertue declared to be second only to Cooper's, are more valued at the present day, notably that of himself in the Dyce collection, South Kensington Museum, which is remarkable in execution and intensity of expression. The Wallace collection, London, possesses a portrait of Charles II by him. He was credited with the authorship of certain satirical works in prose, and he undoubtedly inspired Pope's *Dying Christian* by his own "A Thought of Death," one of the *Poems and Songs.*

FLAT RIVER. A community in St. Francis Co., Mo., 65 miles south of St. Louis, on the Illinois Southern and the Mississippi River and Bonne Terre railroads (Map: Missouri, F 4). Lead mining is the chief industry. It was disincorporated in 1911. Pop., 1910, 5112.

FLATTERS, flȧ′târ′, Paul François Xavier (1832–81). A French officer and explorer, born at Laval, a son of Jean Jacques Flatters, the sculptor. He took part in the Crimean War and was made lieutenant at Sebastopol, distinguished himself in the Italian campaign (1859) and was captured at Sedan. After eight years of service in Algeria he was ordered by the government to act on a commission to consider building a railroad to the Sudan. His first expedition, which started in 1880, got as far as Lake Menkhugh and turned back just in time to escape the Tuaregs. The second trip began in the latter part of the same year and was probably watched all the way by Berber spies. Six hundred men from three Tuareg tribes met the party at Bir-el-Gharama, lured Flatters away and killed him, and later massacred all the party but 20. The official record of the expedition was lost, but some of Flatters's papers were preserved, and they are the basis of

FLATFISH AND FLOUNDERS



1. COMMON OR WINTER FLOUNDER (Pseudopleuronectes Americanus).
2. GREAT FLOUNDER (Platichthys stellatus).
3. SUMMER FLOUNDER (Paralichthys dentatus).
4. ENGLISH SOLE (Solea vulgaris).
5. TURBOT (Rhombus maximus).
6 PLAICE (Pleuronectes platessa).

the earlier knowledge of the Sahara. Consult Brosselard, *Les deux missions Flatters* (2d ed., Paris, 1889).

FLAT'TERY, Cape. See Cape Flattery.

FLAT'ULENCE (from Neo-Lat. *flatulentus*, flatulent, from Lat. *flatus*, a blowing, from *flare*, to blow, OHG. *blâjan*, Ger. *blähen*, AS. *blâwan*, Eng. *blow*). Distension of the stomach or bowels by the gases formed during digestion. See Indigestion.

FLAT'WORM. A general name for a group of worms constituting the phylum Platyhelminthes (q.v.), and embracing the planarians, flukes, tapeworms, and nemerteans. The body in almost all cases is greatly flattened, so as to be leaflike or ribbon-like, with an anterior end marked in some way, though a head is rarely distinct, and right and left sides; some are minute, others easily visible, or like long narrow ribbons. Some are vividly colored, but most are of dull hue, and there is a varying complexity of structure and great diversity in habits of life. In development some are direct, while others go through a metamorphosis. They are the most widely distributed of any phylum, dwelling "on land, in fresh water down to the bottom of some of the deepest lakes, on the seashore, in deep sea, and on the surface of the ocean; and parasitic flatworms live, in one phase or another, in animals of nearly every class of the Metazoa." They are regarded as having been developed from some low ancestral type of cœlenterates. Consult Parker and Haswell, *Text-Book of Zoölogy* (New York, 1910); Gamble, *Cambridge Natural History*, vol. ii (London, 1896); Benham, "Platyhelmia," in Lankester's *Treatise on Zoölogy*, vol. iv (London, 1901). See Fluke; Nemertinea; Planaria; Tapeworm.

FLAUBERT, flō'bâr', Gustave (1821–80). A French novelist. The merit of his works lies not only in their faultless style, acquired by the sacrifice of five and six years on each separate production, but in the precision with which they enunciate a view of the art of fiction that was to dominate the succeeding generation. *Madame Bovary* (1857) gave "the formula of the modern novel" (Zola), the code of the naturalistic school. Flaubert was born in Rouen, the son of a surgeon, and inherited a power of psychic diagnosis and dissection. He was well to do, able to cultivate his taste by travel and to write at leisure. His early influences were strongly romantic, fostered by a violent love affair with a lady whom he has pictured as Madame Arneux in *L'Education sentimentale*, and by a tenderly Platonic attachment to Madame Colet. Hating democracy and its commonplace bourgeoisie, and wishing to hide the disease to which he was subject, which, if not epilepsy, resembled it in its symptoms, he became more and more a recluse. Except for literary journeys to the East, particularly to Carthage, he spent his life at a suburban house in Rouen, cloistered for months together in unremitting study, relieved by occasional visits to Paris, where he gave free scope to a Rabelaisian fancy in the society of the Goncourts, whose *Journal* is filled with his sayings. In general he affected, and in good measure attained, an objective attitude towards life, which, he says, appeared to him as material for description; and he is thus the type of the artist for art's sake. He carefully instilled this same spirit in his pupil and godson, Guy de Maupassant (q.v.). *Madame Bovary* (1857) is the epic of the commonplace, the bitterest satire on romanticism. In it sentiment leads to shipwreck, self-sufficient mediocrity to success. *Salammbô* (1862) applies the same method and philosophy to the civilization of ancient Carthage; *L'Education sentimentale* (1869) to the Paris of 1848, seeking to be "implacable," and becoming unjust, but producing what Zola pronounces "the only truly historical novel that I know in which the resurrection of dead hours is absolute, with no trace of the novelist's trade." In *La tentation de Saint-Antoine* (1874) Flaubert pushed the paradox to its extreme and in 300 pages of the most polished prose of his century sought to express the essential folly and futility of thought itself and of the whole sentient world. *La tentation* is the supreme expression in fiction of nihilistic pessimism, of the idealist turned skeptic, and withal the best example of dream literature in the world. The *Trois contes* (1877) shows Flaubert's genius epitomized. There is pathos of sordid commonplace in *Un cœur simple;* a remarkable power of projection into other realms of thought and life is in *La légende de Julien l'hospitalier*, and in *Hérodias* there is a grandiosely romantic realism. These three tales would alone suffice to define Flaubert's place as the connecting link between the romantic and the naturalistic schools. Belonging to neither, he unites both in a synthesis of romanticism and science that was to guide the development of the French novel for a generation. The above-mentioned masterpieces have been translated into all important languages. His "complete" works were published in 1885 in eight volumes; they did not include his two unsuccessful plays, nor his four volumes of *Correspondance* (1873–85). Consult: Tarver, *Gustave Flaubert as Seen in his Works and Correspondence* (London, 1895); Faguet, *Flaubert* (Paris, 1899); Albalat, *Le travail du style* (ib., 1903); T. de Gaultier, *La philosophie du bovarysme* (ib., 1911); L. Bertrand, *Gustave Flaubert* (ib., 1912).

FLAUGERGUES, flō'zhârg', Honoré (1755–1830). A French astronomer, born at Viviers, where he lived and died, never leaving the town. He refused an offer of the directorship of the observatory of Toulon in 1797, preferring, it is said, to be justice of the peace in Viviers. His contributions to various technical journals from 1790 to 1830 dealt with the satellites of Jupiter, Saturn's ring, the spots and markings on Mars, and especially with comets. He discovered the great comet of 1811.

FLAUX, flō, Armand de (1819–). A French author, born at Uzès. He published *Nuits d'été* (1850), *Sonnets* (1864), and descriptive works on Tunis, Denmark, and Sweden, whither he had been sent upon literary missions by the government.

FLAV'EL, John (c.1630–91). An English Presbyterian divine, born at Bromsgrove, Worcestershire, and educated at University College, Oxford. He became curate at Diptford in 1650 and at Dartmouth in 1656. Under the Act of Uniformity he was ejected from his living, but he continued to preach privately. After 1687 he was minister of a Nonconformist church at Dartmouth. Among his popular writings on practical religion is *Husbandry Spiritualized* (1669). His collected writings appeared in six volumes (London, 1820), and selections, ed. by Bradley (ib., 1823). Consult the memoir prefixed to the collected works.

FLA'VIAN (Lat. *Flavianus*), Saint (c.329–

404), Patriarch of Antioch, 381–404. He led an ascetic life, devoted his property, which was considerable, to the church, became an influential member of the Meletian party in the contest with the Eustathians (see EUSTATHIUS; MELETIUS), and was chosen by the former to succeed Meletius as Patriarch in 381. The Eustathians strove for the recognition of Paulinus, who had already been set up in opposition to Meletius, and a bitter contest ensued. In 387 a serious sedition occurred in the streets of Antioch, and the statues of the Emperor Theodosius were overthrown. Flavian journeyed to Constantinople, and his influence was sufficient to prevent the punishment of the rebellious people. It was then that Chrysostom's famous *Orations on the Statues* were delivered. After 392 Flavian had no rival claimant for the patriarchate, although some of the Eustathians continued to oppose him till his death. None of his writings have survived. His day in the Greek Church is September 26.

FLAVIAN, SAINT (?–449). Patriarch of Constantinople, successor to Proclus in 446. He was the opponent of Eutyches (q.v.). He was deposed in 448 by the Council of Alexandria, and he is supposed to have died from injuries inflicted by Dioscorus, the president of the council, Aug. 11, 449, at Hypæpa, in Lydia. He is enrolled in the martyrology of the Latin church, his day being February 18.

FLAVIAN, SAINT (?–518). In early life a monk, he became Patriarch of Antioch in 498, was deposed in 512, and banished to Petra, in Arabia, where he died, July, 518. He wavered in his faith, yet died in the odor of orthodox sanctity, and was enrolled among the saints of the Greek church and also, after considerable opposition, among those of the Latin church. His day is July 4.

FLAVIAN EMPERORS. A term used to designate three Roman emperors, Vespasian and his two sons, Titus and Domitian.

FLAVIGNY, flà'vē'nyĕ', MARIE CATHERINE SOPHIE DE. See AGOULT.

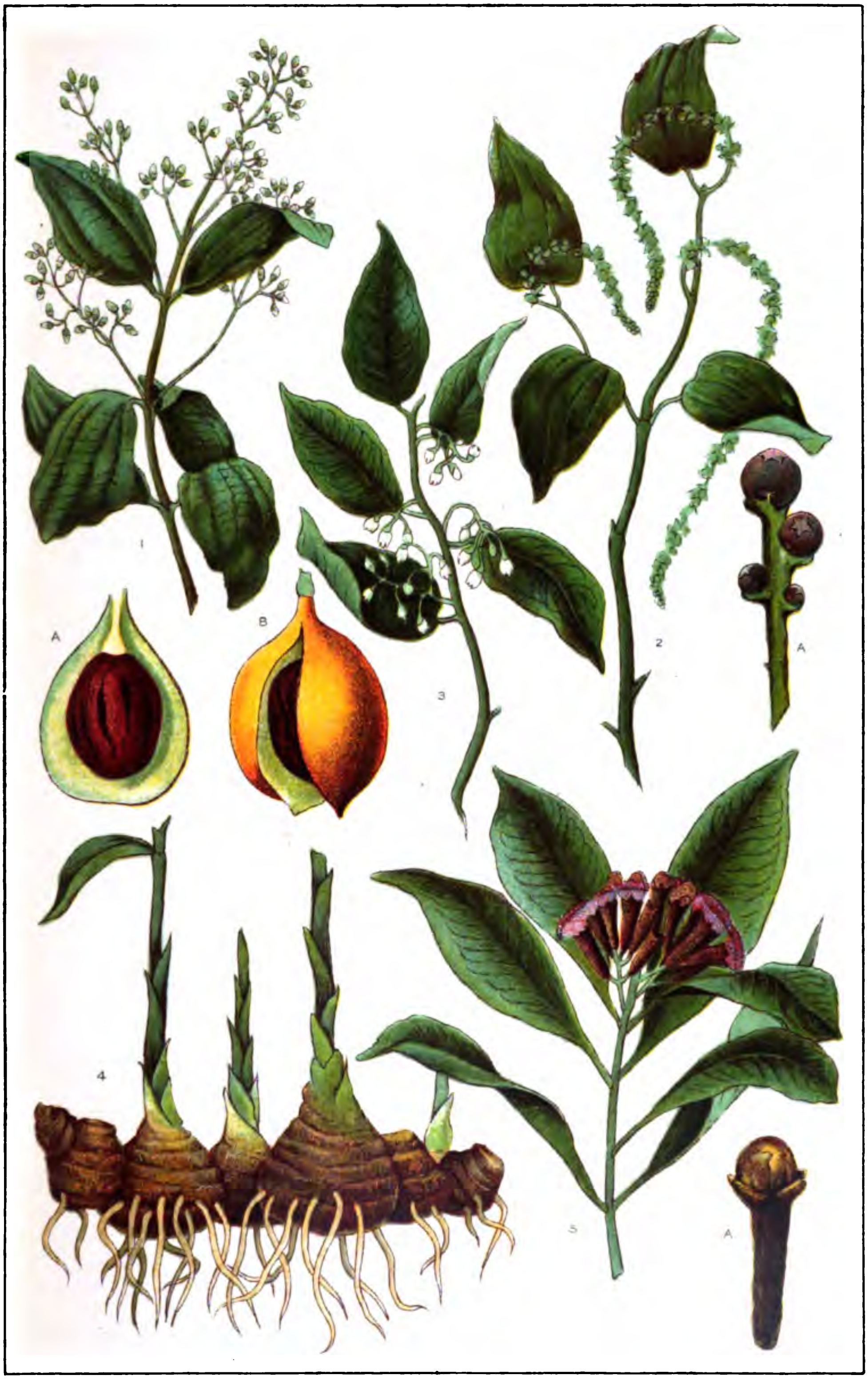
FLAVIN (from Lat., *flavus*, yellow). The most important coloring matter obtained from quercitron. As sometimes prepared, it consists mostly of quercitrin, $C_{21}H_{22}O_{12}, 2H_2O$, (Herzig) or $C_{21}H_{20}O_{11}, 2H_2O$ (Moore). It is then known as yellow flavin. Red flavin, on the other hand, contains only quercetin, $C_{15}H_{10}O_7$. The yellow flavin is probably prepared by extracting quercitron bark under high steam pressure; the red flavin is produced by extracting the bark with alkali and boiling the solution with sulphuric acid. The precipitate formed is washed free from acid and dried. Flavin gives bright yellow or orange shades in connection with alum or tin mordants; with iron mordants, gray, olive green, and a peculiar shade of black; with chromium oxide, olive yellow.

FLAVIO, flä'vyō, BIONDO, or FLAVIUS BLONDUS DA FORLÌ (1388–1463). An Italian historian, humanist and antiquary of Forlì. Ambassador of Forlì in Milan (1388), he lived as an exile in Venice (1423–32), serving as secretary for Barbaro and Barbarigo. He took a similar post with Pope Eugene IV in 1432 and lived in Rome for many of his remaining years. His *Decades*, fashioned after the manner of Livy, became the model for historical writing in their century, setting a new standard for methods of research and for impartial discussion. Biondo, though now entirely supplanted in his subject, was one of the first to become conscious of the great change that occurred in Europe in the transition from Rome to the Middle Ages and to set about the analysis and explanation of it. Consult the *Works* (Basel, 1559), biography by Masius (Leipzig, 1879), and Sabbadini in *Giornale Ligustico* (Genoa, 1891).

FLA'VORING PLANTS (from *flavor*, OF. *flaveur*, odor, ML. *flavor*, yellow gold, yellowness, from Lat. *flavere*, to be yellow, from *flavus*, yellow). Plants which impart their characteristic flavors to condiments, culinary preparations, beverages, medicines, etc., with which they are mixed. Usually the part richest in the flavor is employed either in its native state or prepared in some way. The following examples will illustrate: the bark of the root (sassafras); the root (licorice); rhizome (ginger and peppermint); bark (cinnamon); leaves (bay and culinary herbs, such as sage, thyme, etc.); flower buds (cloves, capers); flowers (hops); arillode of the seed (mace); rind of the fruit (citron, etc.); unripe fruit (allspice); fresh ripe fruit (lemon); dried ripe fruit (vanilla, pepper); seed (nutmeg, caraway). Many of these owe their powers to essential oils, which in some cases are extracted and used in a similar manner; flavors of others are due to esters, alkaloids, etc. Spices, a group of flavoring plants, are almost wholly tropical in their origin and were formerly grown in and exported from the East. Arabia was at one time noted as the land of spices, not so much because spices were produced there as because that country was the great distributing centre. Tropical America, which has made some notable additions to the list of flavoring plants, e.g., Cayenne pepper and vanilla, has developed a profitable industry in the growing and the exporting of certain Asian spices, especially ginger and cloves.

The five spices illustrated herewith are treated more fully under their respective names. 1. Cinnamon is the dried bark of *Cinnamomum zeylanicum* and of its close relatives, trees which grow in the East. The species figured is a native of Ceylon, which is cultivated in many other tropical countries, but nowhere else produces bark of such high quality. 2. Black pepper, the most widely used of all spices, is the dried fruit of *Piper nigrum*, a native of the East Indies, but cultivated in other tropical countries. The stems, which are vinelike and seldom grow more than 20 feet long, spread so much that poles or trees are used to support them. The plants produce a profusion of mostly hermaphrodite flowers in spikes opposite the leaves. The crop is gathered as soon as the first berries become red and is ready for export after drying. 3. Nutmeg is the kernel of the fruit of *Myristica fragrans* and other related species, trees indigenous to the East, but cultivated in the tropics throughout the world. The succulent golden-yellow pearlike fruit opens by two valves and exposes the kernel as shown. These exterior parts, which look like candied fruit, are often preserved as a confection. The inner envelop which surrounds the nut is used in cookery under the name of mace (q.v.). 4. Ginger, the creeping rootstocks of various species of *Zingiber*, of which the commonest is *Zingiber officinale*, is used as a condiment and a medicine, for which purposes it is cultivated in and exported from various tropical countries, especially the West Indies. The finest quality is said to come from Jamaica. The common species is

FLAVORING PLANTS



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1 CINNAMON - CINNAMOMUM ZEYLANICUM
2 BLACK PEPPER - PIPER NIGRUM (A, FRUIT)
3 NUTMEG - MYRISTICA FRAGRANS (A AND B FRUIT)
4 GINGER - ZINGIBER OFFICINALE.
5 CLOVES - EUGENIA CARYOPHYLLATA (A, FLOWER BUD)

a native of the East Indies, where it has been cultivated for hundreds of years. 5. Cloves are the dried flower buds of the clove tree (*Eugenia caryophyllata*), a pyramidal evergreen often 40 feet tall in its native home, the Spice Islands. The leaves, flowers, and bark are aromatic, and the olive-like fruit, which is exported to a small extent under the curious name of "mother of cloves," has a similar but weaker odor and flavor. See HERBS, CULINARY.

FLAX (AS. *fleax*, OHG. *flahs*, Ger. *Flachs;* probably connected with Goth. *flahta*, hair plait, Ger. *flechten*, to weave, Lat. *plicare*, to fold). An annual plant of the genus *Linum* (family Linaceæ), of which there are more than 100 known species, mostly annual and perennial herbs, scattered over the globe. They are most abundant in Europe and northern Africa. The common flax (*Linum usitatissimum*) is an annual indigenous to the Mediterranean region of Europe and Africa and to some parts of Asia, but now distributed over both hemispheres. This most common species of flax has a very slender, erect stem, 2 to 3 feet tall, branching only near the top, which bears beautiful blue, or sometimes white, flowers. The seeds are dark brown, glossy, flattened, with acute edges.

FLAX.

No plant not yielding food to man is more useful than the flax plant. It is highly valuable both for the fibres of its inner bark and for its seeds. Flax fibres are characterized by length, fineness, solidity, and suppleness. Their length is invaluable in spinning, and the nature of their surfaces prevents them from slipping on each other, thus contributing to the durability of fabrics made with them. When separated from both the bark and the inner woody portion of the stem, they constitute the well-known material from which linen thread and cloth are made, and they are used for manufacturing the finest and the coarsest fabrics, the most delicate and exquisite lace, linens, shirtings, and handkerchiefs, twines for shoemakers and harness makers, cords for the warp of carpet and the body of oilcloth, sailcloth, rope, and cordage. The seeds yield by expression the drying fixed oil called linseed oil (q.v.), used for mixing paints, varnishes, etc. The remaining crushed mass is linseed cake, or oilcake, esteemed for feeding cattle, and which, when finely ground, becomes linseed meal. Linseed is sometimes used in medicine as an emollient and demulcent in irritations of the mucous membranes generally, but especially of the pulmonary and urinary organs. The world's annual flax-fibre production is about 1,500,000,000 pounds, of which over 1,000,000,000 pounds is furnished by Russia alone. In no European country is flax more successfully cultivated than in Belgium, where it is employed in the manufacture of Brussels lace, the crop when prepared for market sometimes exceeding in value the land on which it was produced. The excellence of Belgian flax must be ascribed largely to the care bestowed on its cultivation and the superior retting facilities offered along the river Lys.

History. Flax has been cultivated from the earliest historic times. It is mentioned in the Book of Exodus as one of the products of Egypt in the time of the Pharaohs, and microscopic examination has shown that the mummies of Egypt are enveloped in linen cloth. As in the days of Solomon, who purchased linen yarn in Egypt, and as in the time of Herodotus, who wrote of the great Egyptian flax trade, Egypt still grows large quantities of flax. In Europe its cultivation is very extensively carried on, especially in Russia, Austria-Hungary, Belgium, and Ireland. In America it has been cultivated since the period of earliest settlement. During the Civil War in the United States efforts were made in some quarters to substitute it for cotton, the supply of which was cut off. But since the two fibres demand essentially different treatment, and since the machinery employed in the manufacture of cotton fabrics is not adapted to the manufacture of linen fabrics, the experiments were not satisfactory. For its fibre the culture of flax is attracting increased attention in the United States, and it is being produced in small quantities for this purpose in Michigan, Wisconsin, Minnesota, Oregon, and Washington; for its oil it is largely grown in a number of States. From time immemorial flax has been cultivated in India for its seed, but not for its fibre. In that climate the plants seldom exceed 18 inches in height and are much branched, yielding a worthless fibre, but a large quantity of seed richer in oil than the European or the American seed.

Cultivation. Flax will grow in almost any part of the United States, but it needs a strong, rich soil and careful manipulation at every stage of its production and manufacture. The heavier soils, when well drained and of proper fertility, are preferable to sandy loams; wet soils are fatal to success. In general, a deep, moist, strong loam upon upland and free from weed seeds, which must be avoided above all things, will give best results. As far as possible weeds should be eliminated by previous cultivation. Flax is believed to make heavier demands upon the soil than does any other crop, and for this reason it is frequently called exhaustive. In Belgium and other flax-growing countries, where land has been under cultivation for generations, stable manure, which has been well rotted to avoid the danger of fouling the land with weeds, is applied before winter sets in. Previous to sowing time in spring the ground is heavily treated with fertilizers.

Flax demands a greater amount of labor than almost any other crop, and unless extreme care be exercised in every step the value of the crop for fibre will be seriously impaired. Much depends on the thickness of sowing. For a fine fibre flax must be sown thickly and be pulled before the seed is ripe; for a coarse fibre it may be given more room and the seed allowed to reach approximate maturity, but not the hard stage known as "dead ripeness." Coarse fibre and a crop of seed are often preferred by the grower to a crop of fine fibre alone, a departure that experience at home and abroad will countenance, especially since the disproving of the assertion that good fibre and seed cannot be produced by the same plant. Still, flax should be grown with a view of getting from the land a fine quality of fibre, while the seed, which ought to be a factor of profit, should be saved. Usually the crop is pulled, roots and all, by hand, but if the ground be smooth it may be cut with a mower, the implement used when seed alone is passed through an ordinary threshing machine; but since this tangles and breaks the fibre, it must not be used if the fibre is to be saved.

Dressing. The process first gone through after pulling is *rippling*, which consists in tearing off the seeds by pulling the stalks through a flax comb, which consists of a series of iron teeth 18 inches long, placed within a distance of ½ inch of each other. These are fastened in a block of wood, which is placed at the end of a plank or long stool, on which the operator sits. Often the seeds are separated from the stalk by threshing or hammering, but this process, as already stated, is objectionable, as it soils and breaks the stalk. The next process is to obtain the flaxen fibre or lint, free from the woody core, or *boon*, of the stem. This is effected by steeping the bundles in either stagnant or running water till the boon begins to rot, in which state it is readily separated from the fibre. The operation is called rotting, or *retting*, and requires to be managed with great care, as by continuing it too long decomposition might extend to the fibre and render it useless; while by discontinuing it too soon the separation could not be effected with sufficient ease. The time is generally determined by the nature and temperature of the water and the ripeness of the flax, decomposition taking place more rapidly in soft, stagnant water than in running streams, in which the retting is sometimes conducted. Three natural modes of steeping, or retting, the straw are recognized—dew retting, pool retting, and retting in running water. There are also many processes for quick retting, where the temperature of the water is controlled, and also where cereals are used; but the flax of the world is largely retted by natural methods rather than by "processes." For dew retting a moist meadow is the proper place, the fibre being spread over the ground in straight rows at the rate of a ton to an acre. For pool retting the softest water gives the best results, and where a natural pool is not available, such as the "bog holes" in Ireland, "steep holes" are made. The sheaves are kept entirely under water, but without touching the bottom. The fibres sink when decomposition has been carried to the proper point. If the woody portion or core pulls out easily, leaving the fibre intact, it is ready to come out. The operation usually requires from 5 to 10 days. Dew retting is the safest and least offensive method, but it requires much longer time, and in a country where land is valuable would become very expensive. On the whole, the mixed method of retting is preferable—i.e., to steep till decomposition of the boon is well advanced and then to complete the process on the grass. It has been attempted to separate the fibre by machinery without subjecting the flax to retting; but the article so produced has hitherto been rejected as inferior in quality.

Attempts to hasten the process of retting by placing the flax in tanks and using warm water or steam instead of cold water or dew have been more successful. According to the process introduced by Schenk, the flax is placed in vats, in which it is kept down by means of strong framework. Water is allowed to pass into the vats, to become absorbed by the flax; steam is next admitted, till the temperature of the water is raised to, and maintained at, about 90°. Acetous fermentation ensues in a few hours, and after being maintained for about 60 hours, the decomposition of the gummy or resinous matter in the stalk is completed. The mucilage water is next withdrawn from the vat, and the flax taken out, separated, and dried, either in the open air or in desiccating rooms, according to circumstances. Retting in water is usually followed by bleaching on the grass, to secure an even color. This is often accomplished in a few days, but may require several weeks.

The whole process of retting is a typical fermentation. A disagreeable odor arises from the fermenting flax, and the liquid, after the fermentation, is filled with products which make valuable manure. The bacillus which produces the retting has been identified, and it has been shown that the retting is a process of decomposition of the pectin cement. No method of separating the linen fibres in the flax from the wood fibres has yet been devised which dispenses with the aid of bacteria. (See Conn, *Story of Germ Life*, New York, 1900.) In chemical retting, however, dilute sulphuric or hydrochloric acid is used, which completes the process in a few days.

The flax is now ready to be freed completely of its woody particles. This is effected by *scutching*. Previous to this, however, the flax is passed through a *brake*, or revolving rollers, in order thoroughly to crack the boon. The brake, worked by manual labor, consists of a frame, on the upper side of which are a number of grooves; a movable piece is hinged at one end and provided with a similar grooved piece on its lower side, but so placed that the projections pass into the hollows of the lower. The flax, placed between these and struck by bringing down the hinged part, is broken, but the fibre remains uninjured.

In the flax-breaking machine the flax is passed through a series of horizontal fluted rollers; the flutes do not touch, thus preserving the fibre while breaking the boon. In Austria and other European countries a more primitive, but, it is claimed, less injurious method of breaking is pursued, in which the fibre is opened with a "bott hammer" (batting hammer), which is made of wood ridged like a cook's implement for pounding steak. In continental countries scutching is almost invariably performed by hand, the flax being held in a groove made in an upright stand and struck by a flat blade. Machine scutching is much more certain and expeditious than hand scutching and is, in consequence, fast superseding it in Great Britain. After passing through the breaking machine the flax is subjected to the action of a series of knives attached to the arms of a vertical wheel; these knives strike the flax in the direction of its length. The process is gone through three times before the flax is ready for the market. Although machine scutching is expeditious, it is not capable of that pliant adaptation to the varying nature of the flax to be operated upon, which is obtained in hand scutching. The effect of machine scutching is to produce fineness by reducing and imparting rather than sustaining the character of the fibre—viz., the length and fineness of its "staple," or fibre. In the chapter on "The present Status of Flax Culture," in the *Year Book* of the United States Department of Agriculture for 1897, the statement that a practical machine scutcher is a desideratum still holds good, although many such machines have been invented.

The initial processes of linen manufacture thus far described are usually performed by the farmer, although there is a tendency within recent years for the preliminary work of retting, bleaching, breaking, and scutching to be performed by companies, who buy the straw direct from the fields and prepare it for the linen factory. The next step that the flax undergoes is that of heckling, the object of which is to separate the longer and better portion of the fibre, called "line," from the shorter and raveled portion, called "tow." The hand heckle is a many-toothed steel comb, and the fineness of the flax increases with the number of times it is heckled, each time with a finer and finer instrument. Heckling is now usually performed by machinery. (See HECKLE.) The fibre is then in readiness for spinning and for manufacture into linen, for which operations see the articles on SPINNING and LINEN.

The world's annual production of flaxseed averaged about 75,000,000 bushels per annum prior to 1900, about 100,000,000 per annum from 1900 to 1911, and was 130,000,000 in 1912. The production is about equally divided among five countries,—the United States, Canada, Argentina, India, and Russia,—the product of 1912 being: United States, 28,073,000 bushels; Canada, 26,130,000; Argentina, 22,518,000; India, 25,680,000, and Russia in Europe, 22,177,000. Little effort is made in the United States to utilize the fibre, the plant being grown almost exclusively for its seed. In 1913 the United States produced 17,853,000 bushels of flaxseed on 2,291,000 acres. Over 7,000,000 bushels were produced in North Dakota, where more than double that quantity has been secured in more favorable seasons. The record production of the United States is 29,285,000 bushels. Consult: Dodge, *Dictionary of the Fibre Plants of the World* (Washington, 1897); also "Fibre Investigations," in *United States Department of Agriculture, Report No. 9* (ib., 1897); "Flax for Seed and Fiber," *United States Department of Agriculture, Farmers' Bulletin 27*. See FIBRE.

FLAX, FALSE. See GOLD OF PLEASURE.

FLAX, NEW ZEALAND. A valuable fibre, quite different from common flax, obtained from the leaf of a lily-like plant, *Phormium tenax*, sometimes called harakeke. It is a perennial belonging to the family Liliaceæ, a native of New Zealand and Norfolk Island. Its leaves are from 2 to 6 feet long and 2 to 3 inches broad: the flowers brownish yellow; the fruit a three-cornered capsule with numerous compressed jet-black seeds. The fibre of the leaves, which is both very fine and very strong, was used by the New Zealanders for making dresses, ropes, twine, mats, cloth, etc., before the discovery of New Zealand by Europeans. New Zealand flax thrives best on rich lowlands near rivers and in such places is used in its native country for making twine and ropes. It is also grown to some extent in California, and its cultivation has been attempted in parts of Europe; but the winters, except in the south, are too cold for it. To obtain the fibre the leaves are cut when they have attained their full size and are usually macerated in water for a few days. The New Zealanders formerly procured the fibre in its greatest perfection—very long and slender and shining like silk—by a more laborious process, without maceration. They removed the epidermis from the newly cut leaf, separating the fibres with their thumb nails and then more perfectly by combs. Large manufactories are now constructed, wherein the fibre is stripped by machinery. The best lands yield 10 tons per acre of sun-dried leaves, which produce 1200 pounds of fibre and 80 pounds of tow. See FIBRE.

FLAX'MAN, JOHN (1755–1826). A leading sculptor of the English school and a draftsman. He was born at York, July 6, 1755, the son of John Flaxman, a modeler and maker of plaster casts in London. His health was delicate, and he had little early education. The most powerful and perhaps the earliest impulse which he received toward art appears to have been derived from two customers of his father, the painter Romney and a Reverend Mr. Matthew. His familiarity with the ancient poets begins at this time. Flaxman showed precocious talent for modeling in clay and drawing and entered the school of the Royal Academy in 1770, the second year after its foundation. He exhibited in the same year, and won a silver medal. In the competition for the gold medal in 1772 he was not successful.

Flaxman's actual career begins with his engagement in the pottery of Josiah Wedgwood in 1775. England was at this time thoroughly impregnated with the love of antiquity, prevalent in the latter part of the eighteenth century. Wedgwood was one of the leaders in the movement toward the realization of antique conditions, and Flaxman was inspired with the same devotion.

Flaxman's work for Wedgwood was usually confined to small reliefs. As processes of manufacture improved, however, more ambitious performances were undertaken, e.g., large bas reliefs for chimneypieces in 1776, a large tablet of "Apollo and the Muses" in 1777, etc. During this early part of his life he was intimately associated with William Blake. The influence of Flaxman's sense of outline and proportion often appears in the painter's works; and the flavor of Blake's mysticism may be detected in the works of the sculptor.

In 1782 Flaxman established an independent studio in Wardour Street, London, and married Anne Denman. In 1787 he went to Rome, which was then under the influence of the school of archæologists and sculptors of which Winckelmann was the head and Canova and Thorvaldsen the leading practical workers. The prevailing interest was classical, the art of the Renaissance being entirely neglected. Flaxman's most important works in Rome were the superb series of outline illustrations to Homer's *Iliad* and *Odyssey*. The plates to Æschylus and Dante appeared later. These drawings, made under the need of breadwinning, and the outline illustrations to Hesiod, published in 1817, have become the best known, and are certainly the most interesting and characteristic of Flaxman's productions. His chief works of sculpture in Rome were a group of "Cephalus and Aurora," for Thomas Hope, and a restoration of the Belvedere "Torso of Hercules," which he conceived to be part of a group of two figures, "Hercules and Omphale." This piece was afterward destroyed. While in Rome he made a large collection of plaster casts for the painter Romney. Flaxman returned to England in 1794. In 1797 he was elected associate, in 1800 a full member, and in 1810 professor of sculpture, at the Royal Academy. His lectures, 10 in number, were published in 1829.

Flaxman died Dec. 7, 1826, and is buried in the church of St. Giles-in-the-Fields, London. Casts of the principal of his very numerous works have been collected in a special museum in University College, London. Among the most important of his funeral reliefs, scattered throughout the churches of England, in which he is seen to better advantage than in his heroic sculptures, are the monuments to Lord Mansfield, in Westminster Abbey (1796), and to Sir William Jones, in the church of St. Mary's, Oxford (1797); several monumental works for the East India Company; and the monument to Captain Montague, in Westminster Abbey (1802). He projected but did not execute a colossal statue of "Britannia," 200 feet high, to be placed on Greenwich Hill (1800). He designed also the monuments to the Baring family in Micheldeaver Church, Hampshire (1811); to Sir Joshua Reynolds in St. Paul's (1807); to Lord Cornwallis for Prince of Wales Island (1812); and to Sir J. Moore in Glasgow (1813). Among his ideal works are a tripod executed by the goldsmiths Rundell and Bridge, and presented to John Kemble in 1817; a charming but unhomeric realization of Homer's "Shield of Achilles," which was made in silver gilt and bronze by the same artisans (1818); a pedimental group in marble for the Duke of Bedford's sculpture gallery at Woburn (1820); a group of "Maternal Love" for the monument to Mrs. Fitzharris (1817); the great group of "Saint Michael and Satan" (1821); and "The Pastoral Apollo" (1824). But it is in his drawings, both outline illustrations and studies, that his genius finds most charming and characteristic expression. The most extensive public collections of these are in University College, the British and South Kensington Museums, London, and the Fitzwilliam Museum, Cambridge. Consult: Cunningham, *Lives of the Most Eminent British Painters, Sculptors, and Architects* (London, 1830–33); Meteyard, *The Life of Josiah Wedgwood* (ib., 1865–66); id., *Choice Examples of Wedgwood Art from Designs of Flaxman* (ib., 1879); *The Drawings of Flaxman, with Introduction and Descriptions by Colvin* (ib., 1876); Scott, *The British School of Sculpture* (ib., 1872); Doin, in *Gazette des Beaux-Arts* (Paris, 1911, ser. 4, vol. v); and Colvin, in *Dictionary of National Biography*, vol. xix (London, 1889).

FLAX'SEED. Both the seed and the oil are used in medicine. The seed contains a viscid, fixed oil, 30 to 35 per cent, mucilage 15 per cent, proteids 25 per cent, and a minute quantity of amygdalin. Linseed oil is a fixed oil expressed from the seed without the use of heat. It is a yellowish, oily liquid, having an odor peculiar to itself, and a bland taste when fresh. Its principal ingredients are linolein, myristin, palmitin, and a high percentage of albumin, to which its drying properties are attributed. Linseed tea, made by boiling together 3 parts of linseed, 1 part of licorice, and 100 parts of water, is a common domestic remedy for slight colds and sore throats. It is soothing, demulcent, and mildly diuretic. The seed itself is also used to make poultices, 4 parts of the seed being mixed with 10 parts of boiling water. It is used to relieve pain, to hasten the formation of abscesses, and as a counterirritant in deep-seated inflammation. Linseed oil mixed with an equal quantity of lime water forms Carron oil (q.v.), a common remedy for burns.

FLEA (AS. *flēah*, Icel. *flō*, OHG. *flōh*, Ger. *Floh;* connected with OHG. *fliohan*, Ger. *fliehen*, to flee, AS. *flēon*, Icel. *flȳja*, Goth. *þliuhan*). One of the small wingless insects now commonly regarded as constituting a distinct order, Aphaniptera or Siphonaptera, containing a single family, Pulicidæ. All the species are very similar to the common European flea (*Pulex irritans*), which is plentiful in most parts of the Old World and lives by sucking the blood of man and of certain quadrupeds and birds. It abounds particularly in the nests of poultry, pigeons, and swallows, and wherever dust accumulates in the chinks of floors, etc., and it is to be found also plentifully in beds wherever cleanliness is neglected. The abundance of fleas in some hot sandy countries is an intolerable nuisance to both travelers and residents. The female is rather larger and stronger than the male, but the sexes are otherwise very similar. The head is small, very compressed, rounded above, and has on each side a small round eye. The mouth has two lancet-like mandibles, the maxillæ being represented by two conical scales, the mandibles and the maxillæ forming a suctorial beak, with a slender, bristle-like tongue, the whole inclosed between two three-jointed plates. The thorax consists of three segments, the second and third of which bear a scale on each side, regarded as rudimentary wings. There is no marked division between the thorax and the abdomen, which consists of nine segments, much larger than those of the thorax, but much compressed. The whole body is covered with a tough integument. The activity of the flea, its power of leaping, and its extraordinary strength are well known. Its strength has been sometimes applied to the drawing of miniature carriages, cannon, etc. Fleas undergo a complete metamorphosis. The female lays about a dozen white eggs, slightly viscous. The larva is long and slender, at first white; afterward reddish, and destitute of feet. It subsists upon animal particles in dust and upon the loosened particles of skin caught among an animal's hairs. When about to change into a pupa, it incloses itself in a little silk cocoon, from which emerges the perfect flea. Cleanliness and careful attention are the principal means of keeping beds and houses free of fleas; but where these are found insufficient, a free use of kerosene is recommended. The common flea of households in the United States is that of the cat and dog (*Pulex serraticeps*). The flea prevalent upon human beings in the Old World (*Pulex irritans*) is rarely seen in America. Squirrels, foxes, rats, and some other animals have separate species, of which in all about 100 are known, a third of which are American. Fleas have been accused of spreading disease, Grassi alleging that the cat-and-dog flea is an intermediate host for tapeworms; and certain others may carry the bubonic plague. Consult Doane, *Insects and Disease* (New York, 1910), and Russel, *The Flea* ("Cambridge Manuals," Cambridge, 1913). See CHIGOE.

FLEA'BANE. A common name applied in the United States to plants of the genus *Erigeron* (q.v.) and in England to those of *Pulicaria*, which belong to the family Compositæ. The whole plant emits a peculiar aromatic smell, which is said to be efficacious in driving away fleas and other insects. Two species are found in England, one of which, *Pulicaria dysenterica*, common in most places, has oblong leaves, a cottony stem 12 to 15 inches high, and panicled flowers. It has been used in diarrhœa and dysentery. The name "fleabane" is also applied to a species of an allied genus, *Conyza squarrosa*.

FLEA BEETLE. Any of many of the smaller leaf beetles of the family Chrysomelidæ, so called on account of their activity in jumping, and characterized by the great thickening and muscularity of the hind femora. They were formerly grouped under the name Haltica, but are now divided into the genera *Psylliodes*, *Dibolia*, *Phyllotreta*, *Galeruca*, *Diabrotica*, and their allies. Many of them do vast damage to shade trees and farm crops. See LEAF BEETLE, and the accounts of insects affecting the MELON, GRAPE, TURNIP, ETC.

FLEA LOUSE. A plant louse of the family Psyllidæ, having "two-jointed tarsi, antennæ eight or nine jointed, and the hind legs with somewhat swollen thighs," enabling them to leap vigorously, as other plant lice do not. Many forms make galls, others secrete honeydew; and they live upon certain trees, which they damage seriously. One species (*Psylla pyricola*) is a pest of pear trees in the northwestern United States. Consult Riley, "Notes on American Psyllidæ," in *Proceedings of Biological Society of Washington*, vol. ii (Washington, 1884). See PEAR INSECTS.

FLEANCE, flē'*a*ns. The son of Banquo, in Shakespeare's *Macbeth*. Macbeth instigates an attempt against his life in fear that the witches' prophecy will be fulfilled, and that he will come to the throne of Scotland.

FLÈCHE, flĕsh, LA. The capital of an arrondissement in the Department of Sarthe, France, situated on the right bank of the Loir, 24 miles south-southwest of Le Mans (Map: France, N., E 5). It has a town hall, a theatre, and a museum, and is celebrated for the Prytanné military school (founded 1774), with its library of 20,000 volumes, situated in an old Jesuit college built by Henry IV. It is a preparatory school for Saint-Cyr. Among famous alumni of the former college have been Prince Eugène, Descartes, and Picard, the astronomer. La Flèche has some trade in corn, hay, and wine, also manufactures of oil, paper, bicycles, leather, and gloves. Pop. (commune), 1901, 10,519; 1911, 10,830.

FLECHERE, JOHN WILLIAM DE LA. See FLETCHER, JOHN WILLIAM.

FLÉCHIER, flā'shyā', VALENTIN ESPRIT (1632–1710). A French ecclesiastic. He was born at Pernes, near Avignon, and educated in the College of the Congregation of Christian Doctrine at Tarascon. In 1659 he went to Paris and taught for a time, but soon gave himself entirely to preaching. He won great fame as an orator, and particularly by his funeral orations, among which that on Marshal Turenne (1676) is considered his masterpiece. That on Madame Montausier secured his admission to the Academy at the same time with Racine (1673). He also wrote poems in French and Latin, and political compositions, among which were the *Carmen Eucharisticum* (1660), celebrating the Peace of the Pyrenees; *Circus Regius* (1662), describing a tournament given by Louis XIV; and *Mémoires sur les grands jours de Clermont* (first published in 1844), in which he relates in half romantic and half historic form the proceedings of that extraordinary court of justice. In 1685 he was appointed Bishop of Lavaux, and in 1687 of Nîmes. The Edict of Nantes had been revoked two years earlier, and Calvinists were still numerous in the bishopric. In the troublous times which followed he softened, to the utmost of his power, the rigor of the edicts, and showed himself so sensible to the evils of persecution and so indulgent even of what he regarded as error, that his memory was long held in veneration by the Protestants of the district. In the famine which followed the winter of 1709 he assisted all in his diocese without regard to their religious tenets, declaring that all alike were his children. His works appeared at Nîmes (10 vols., 1782) and at Paris (2 vols., 1856). His funeral orations have been often printed (an edition by Fabre, Paris, 1886); that on Marshal Turenne may be found in English in Fish, *History and Repository of Pulpit Eloquence* (New York, 1856), and in Lee, *The World's Orators*, vol. iv (ib., 1900). For his life, consult Delacroix (3d ed., Paris, 1883).

FLECHSIG, flĕk'zĭk, PAUL EMIL (1847–). A German physician. He was born at Zwickau and was educated at the University of Leipzig, where he was appointed professor of psychiatry in 1884. His close personal investigations of the various European systems for the treatment of insanity secured for him an appointment in 1882 as director of the Clinical Institute of Psychiatry and Neurology at Leipzig, on the organization and management of which he subsequently published the work entitled *Die Irrenklinik der Universität Leipzig in den Jahren 1882–86* (1887). There is an area in the spinal cord known as Flechsig's Oval area. His original investigations on the structure of the brain are embodied in the work entitled *Die Leitungsbahnen im Gehirn und Rückenmark des Menschen auf Grund entwicklungsgeschictlicher Untersuchungen dargestellt* (1876).

FLECK, EDUARD (1804–79). A Prussian writer on military law, born at Pförten, Lower Lusatia. After serving as auditor of the garrison at Magdeburg, he was appointed general auditor of the Prussian army in 1857. In 1876 he was invested with the rank of lieutenant general. He was long an instructor in the Military Academy at Berlin and during a period of more than 30 years assisted in the formation of nearly every important military law enacted in Prussia. His works, which relate chiefly to military jurisprudence, comprise the following: *Erläuterungen zu den älteren preussischen Kriegsartikeln* (latest ed., 1850); *Die Verordnungen über die Ehrengerichte im preussischen Heer* (3d ed., 1865); *Kommentar über das*

Strafgesetzbuch für das preussische Heer (latest ed., 2 vols., 1869); *Militärstrafgesetzbuch für das deutsche Reich* (1875; 2d ed., 1880).

FLECK, JOHANN FRIEDRICH FERDINAND (1757–1801). A noted German actor of the National Theatre at Berlin. He was born at Breslau and in youth studied theology, for a time attending the University of Halle. Having joined a theatrical troupe, however, at Leipzig in 1777, he went, two years later, to Hamburg, where he became very successful. He made his appearance at Berlin in 1783. Among his celebrated characters were Karl Moor, Götz, Lear, Shylock, and Wallenstein.

FLECKEISEN, flĕk'ī-zen, CARL FRIEDRICH ALFRED (1820–99). A German classical scholar, born in Wolfenbüttel (Brunswick). He studied at the University of Göttingen and was connected with educational institutions at Frankfort-on-the-Main and at Dresden, where from 1861 until his retirement in 1889 he was associate principal of the Vitzthum Gymnasium. From 1855 he was editor of the department of classical philology in Jahn's *Jahrbücher für Philologie und Pädagogik*. His publications include *Kritische Miscellen* (1864); a recension of Halm's text edition of the *Vitæ* of Nepos (last impression, 1898); a standard critical edition of Terence (1857; revised and enlarged, 1898); *Exercitationes Plautinæ* (1842), a scholarly discussion of the language of Plautus; an edition of the text of 10 plays of Plautus, to which was prefixed an *Epistula Critica ad F. Ritschelium* (1850–51); *Fünfzig Artikel* (1861). His best work was on Plautus and Terence; here he had no superior save Ritschl (q.v.). Consult Götz, in Bursian's *Biographisches Jahrbuch für Altertumskunde*, vol. xxiii (Leipzig, 1900).

FLECKNOE, flĕk'nō, RICHARD (?–c.1678). An English versifier of the seventeenth century, about whom very little is known. It is said that he was an Irishman and a Roman Catholic priest, and according to his own account he traveled much in Europe, Asia, Africa, and America, wanderings which he described in *A Relation of Ten Years' Travels* (1656). His writings, consisting of plays, epigrams, and miscellaneous poems, are no longer read even by scholars; and in his own time he was the type of a dull and tiresome versifier. As such, he was immortalized in Dryden's *Mac Flecknoe* (1682).

FLEE FROM THE PRESS. A poem ascribed to Chaucer, before 1532, but attributed by many later critics to John Lydgate. It is sometimes known as the *Balade of Goode Counseil*.

FLEET, THE. A small creek, anciently called Fleta, rising near Hampstead Hills and passing near the west wall of London City. Its lower portion was navigable at the time of Edward I, but it is now arched over and converted into one of the large city sewers, discharging into the Thames at Blackfriars Bridge. Its pestilential condition when the water was diverted is described by Jonson, Pope, Swift, Gay, and other writers.

FLEET MARRIAGES. Irregular and clandestine marriages, celebrated in the Fleet Prison and vicinity towards the end of the seventeenth and during the eighteenth century. The Fleet Prison naturally had its chapel where regular marriages could be contracted; and there is no reason for believing that the earliest recorded marriages in the Fleet (1613–74) were in any way irregular. But in the latter half of the seventeenth century clandestine marriages became very common in England, owing to the great expense of the public ceremony. In many of the churches marriages were performed without license or banns. By an Act of 1696 (17 and 18 Wm. III, c. 35, §§ 2, 3) a penalty of £100 was imposed upon any clergyman who married or permitted another to marry couples otherwise than by banns or license. This act partially checked clandestine marriages in the Fleet Chapel, but it had no restraining influence upon the debtor clergymen of the prison, for whom the penalty of a fine could have no terrors. Accordingly it came to be common for those who desired to be married in secret to resort to the Fleet. Irregular clergymen and even laymen gathered in the vicinity to share in the business of performing marriage ceremonies. They opened offices in alehouses and barber shops and employed "pliers" or "touts" to secure the custom of those desiring their services. A scandalous competition arose in which these clergymen strove to outdo one another in laxity in order to increase their business. Registers of marriages were kept and manipulated to suit the desire of the contracting parties. Youths were enticed into marriage with persons of low degree; bigamous marriages were connived at by the clergyman, who thus gained an additional fee. The abuses of the system, in short, would be beyond credence were they not attested by a vast amount of evidence.

These marriages were not illegal, since before the Act 26 Geo. II, c. 33, there was no necessity in England for any religious ceremonial in the performance of a marriage, which might be contracted by mere verbal consent. But those who had contracted a Fleet marriage had no evidence of the fact. The Fleet parsons kept registers, indeed, but they were so notoriously falsified that they were not received as evidence in courts of law (Doe I. Davies *v.* Gatacre, 8 Carr and P. 578). Thus innocent parties were frequently involved in the greatest hardships. Finally conditions became so intolerable that it was necessary to sweep away the whole system. The 25 Geo. II, c. 33, declared void all marriages in England that should be solemnized otherwise than in a church or public chapel where banns had been published, unless under a special license. The Fleet marriage disappeared when this act went into force. Consult Burn, *History of Fleet Marriages*, and Ashton, *The Fleet* (London, 1889).

FLEET PRISON. A celebrated London jail, which stood on the east side of Farringdon Street, on what was formerly called Fleet Market. The keeper of it was called the warden of the Fleet. It derived its name from the Fleet rivulet (so named from its rapidity), which flowed into the Thames. In 1842 the separate jurisdiction anciently vested in the wardens of the Fleet and the Marshalsea was abolished, and their functions transferred to the Court of Queen's Bench, the Fleet being thenceforth known as the Queen's prison. The Fleet was the royal prison as far back as the twelfth century. The followers of Wat Tyler burned it in the reign of Richard II. In the sixteenth and seventeenth centuries it acquired a high historical interest from its having been the prison of the religious martyrs of the reigns of Mary and Elizabeth, and of the political victims of the courts of the Star Chamber and High Commission in that of Charles I. On the abolition of the Star Chamber, in 1641, the Fleet became a place of confinement for debtors and persons committed for contempt by the courts of Chancery, Exchequer, and Common Pleas. During the eighteenth century it was the scene of every kind of atrocity and brutality, from the extortion of the keepers and the custom of permitting the warden to underlet it. The Fleet was several times rebuilt; the last building was erected after the burning of the older one in the Gordon riots of 1780, the predecessor of which had been destroyed in the great fire of London in 1666. Latterly it usually contained 250 prisoners, and kept ward of about 60 outdoor *détenus* for debt privileged to live within the rules. See Debtor.

FLEET STREET. An old street of London, which takes its name from the Fleet stream; formerly a favorite place for shows and now noted for its banking, newspaper, and printing offices. Consult W. G. Bell, *Fleet Street in Seven Centuries* (New York, 1912), and E. B. Chancellor, *Annals of Fleet Street* (ib., 1912).

FLEETWOOD, or **FLEETWOOD-ON-WYRE.** A seaport and military station in Lancashire, England, on the estuary of the Wyre, about 20 miles southwest of Lancaster (Map: England, C 3). It was planned and founded in 1836 by Sir Peter Hesketh Fleetwood, in whose honor it was named, and is a favorite resort for sea bathing. It has a fine harbor with extensive docks and an important shipping trade. The town owns its tramway service (which it acquired in 1909), electric-lighting works, slaughterhouses, and other public utilities. Pop., 1901, 12,082; 1911, 15,876.

FLEETWOOD, Charles (?–1692). An English parliamentary soldier. He was studying at Gray's Inn at the outbreak of hostilities between Charles I and the parliamentary forces and joined the latter, enrolling in 1642 as a private trooper in the life guard of the Earl of Essex, but was promoted rapidly and was colonel of a regiment of horse at Naseby. In 1646 he entered the House of Commons. In the quarrel between Parliament and the army in 1647 he was one of the officers appointed by the army to treat with the parliamentary commissioners. He took no part in the King's trial, but was made Governor of the Isle of Wight in 1649, accompanied Cromwell to Scotland in 1650, participated in the battle of Dunbar, and in 1651 became a member of the Council of State and as a lieutenant general commanded the cavalry at the defeat of Charles II at Worcester. In 1652 he married Cromwell's daughter, Bridget, the widow of Ireton, and was made commander in chief of the parliamentary forces in Ireland, where he stayed until 1655, the last year with the rank of Lord Deputy. He ardently supported the proclamation of the Protectorate. His rule in Ireland was not a success, and Cromwell recalled him, although he continued to hold the title of Lord Deputy until succeeded by Henry Cromwell in 1657. In 1655 Fleetwood was one of the major generals appointed to look after the interior administration of the realm. He opposed the proposal to make Cromwell King, was a member of the newly constituted House of Lords, and supported the Protector in his later quarrels with Parliament and in his foreign policy. After Cromwell's death he was accused of attempting to succeed him as Lord Protector, and possibly was Oliver's choice. Although he gave his support to Richard Cromwell, he was constantly the centre of the army intrigues to supplant him. He was commissioned commander in chief of the army in 1659. He took no part in the restoration of Charles II, but did not oppose it, and as a result was included in the Act of Indemnity, being incapacitated from holding office. He lived for 32 years after the Restoration, but did not again take part in public affairs.

FLEETWOOD, George (?–c.1665). An English parliamentary leader, born in Buckingham. In 1643 he raised a troop of dragoons for the Parliament. He represented his native shire in the Long Parliament (1647), and in 1649 he signed the death warrant of Charles I. Cromwell made him first a knight, then a lord. At the Restoration he was condemned to death as a regicide, but upon forswearing his former allegiance and furnishing proofs of repentance he was merely deprived of his estates. He probably spent the remainder of his life in America.

FLEETWOOD, George (1605–67). A general in the Swedish service, born at Cople, Bedfordshire, England. In 1629 with a troop of horse he joined Gustavus Adolphus in Germany, and in 1630 he raised an infantry regiment for him in England. He was knighted in 1632 and was made Baron by Queen Christina in 1654. In 1655 he was sent to London as Swedish Envoy Extraordinary. Two years later he was made lieutenant general and in 1665 a member of the Swedish Council of War. He married in Sweden (1640) and had two daughters and four sons. One of the latter became a soldier in the guard of Charles II. Consult Guernsey Jones, *The Diplomatic Relations between Cromwell and Charles X of Sweden* (London, 1897).

FLEETWOOD, John. The name—probably a pseudonym—given as that of the author of *The Life of Jesus Christ and the Apostles*, first published in London in 1767 and many times reprinted. The work had an immense circulation and for nearly 100 years was the only life of Jesus read in religious families in English-speaking countries. It is now seldom read. *The Christian Prayer Book* (1772) and a *Christian Dictionary* (1773) are also attributed to the same author.

FLEETWOOD, William (1656–1723). An English clergyman and author, born in the Tower of London and educated at Eton and at King's College, Cambridge. He took holy orders and became a noted preacher of his time. He was royal chaplain to William and Mary and was canon at Windsor under Queen Anne, who made him Bishop of St. Asaph (1708). In 1712 he published four funeral sermons and in his preface attacked the doctrine of nonresistance. The Commons ordered the book burnt; but by being printed in the *Spectator* (No. 384) the preface attained greater publicity. Nine years before his death he was elected Bishop of Ely, and he was buried in that cathedral. His nephew collected his sermons into a single volume with a brief memoir (1737). His *Essay on Miracles* (1701) provoked a reply (1702) from Bishop Hoadly; and these two essays called out John Locke's discourse on *Miracles* (1702).

FLEGEL, flā'gel, Eduard Robert (1855–86). A German traveler, born at Vilna, Russia. In

1875 he became connected with the factory at Largos, Guinea, West Africa; in 1879 ascended and surveyed the Benue, and from that time on was unceasing in his efforts to open that river and the adjacent region to German trade. In 1882 he discovered the source of the Benue near Ngaumdere, Kamerun. He visited Europe in 1884, obtained the support of the German African Society and of the Colonial Union, and was commissioned by the Emperor to present gifts to the Sultan of the powerful native State of Sokoto. When he returned, however, with the object of establishing trading posts in the district between the Niger and the Benue, he found that the territory had already been occupied by the English Niger Company. He was recalled to Europe in 1886, but died on the coast. He wrote *Lose Blätter aus dem Tagebuch meiner Haussafreunde* (1885) and *Vom Niger bis Benuë; Briefe aus Afrika* (1890). Consult also *Mitteilungen der afrikanischen Gesellschaft in Deutschland*, vols. iv and v (Berlin, 1883–89).

FLEISCHER, flish′ĕr, Charles (1871–). An American religious leader, born at Breslau, Germany. He came to the United States in 1880 and graduated from the College of the City of New York (A.B.) in 1888, from the University of Cincinnati (Litt.B.) in 1893, and as rabbi from the Hebrew Union College, Cincinnati, in 1893. From 1894 to 1911 he was rabbi of the Temple Israel, Boston, and thereafter was leader, in the same city, of the "Sunday Commons," an independent religious institution which he organized in 1911. He became known also as a lecturer and magazine contributor. He published *American Aspirations* (1914).

FLEISCHER, Heinrich Leberecht (1801–88). A distinguished German Orientalist, born at Schandau in Saxony. He studied theology and Oriental languages in Leipzig and later in Paris, under De Sacy and Caussin de Perceval, from 1824 to 1828. He began his career as teacher at a gymnasium in Dresden, to which post he was appointed in 1831, and while there catalogued the manuscripts in the Oriental department of the Saxon Royal Library. In 1835 he was appointed to a professorship of Oriental languages in the University of Leipzig, which he retained until his death, in 1888. Fleischer became the teacher of almost all the Oriental scholars in Germany during two generations, and his career marks an epoch in Oriental studies. He is principally known as an Arabist. His most important publications are: (1) Abulfeda, *Historia Ante-Islamica*, with notes and a Latin translation (1831); (2) an edition of *Ali's Hundred Sayings* (1837); and (3) an edition of Beidhawi's *Commentary on the Koran* (1844–48); and three volumes of *Beiträge zur arabischen Sprachkunde* (1863–84). In addition to this, he assisted in editing a large number of texts published by various scholars, made many contributions to Levy's Aramaic and Talmudical dictionaries, and in numerous other ways left an impress on Oriental studies in the nineteenth century. He was one of the founders of the German Oriental Society and a constant contributor to it and to the Royal Saxon Academy.

FLEISCHER, Hermann Anton Moritz (1843–). A German agricultural chemist, born at Cleves, Prussia. He studied in Berlin, and after several years of service as assistant in various agricultural institutions, he was made director of the Agricultural Experiment Station at Bonn in 1875 and of the Moor Station at Bremen in 1877. From 1891 to 1898 he was professor of chemistry and thereafter of moor culture at the Agricultural Institute of Berlin, and he remained connected with the Agricultural Experiment Station of Bremen in the capacity of curator. His published works include: *Die Thätigkeit der Central-Moorkommission* (1882); *Die Torfstreu, ihre Herstellung und Verwendung* (1900). He also published important contributions in the *Landwirtschaftliche Jahrbücher* and in the *Protokolle der Sitzungen der Central-Moorkommission*. For 10 years he was the editor of *Biedermanns Centralblatt für Agrikulturchemie*.

FLEISCHER, Oskar (1856–). A German musical scholar and writer, born in Zörbig (Saxony). From 1878 to 1883 he studied philology at the University of Halle, where he received the degree of Ph.D. He then studied music under Spitta in Berlin. After three years of travel for the purpose of studying old manuscripts he was in 1888 placed in charge of the royal collection of musical instruments. In 1892 he established himself as docent of the science of music at the University of Berlin and in 1895 was made professor. In 1899 he founded the Internationale Musikgesellschaft, the publications of which he edited until 1904, and to which he contributed many important essays. His chief work is *Neumen Studien* in three volumes (1895, 1897, 1904), the result of original and profound research. He also wrote an excellent biography of Mozart (1899).

FLEISCHMANN, flish′mân, Wilhelm (1837–). A German agricultural historian and chemist, born in Erlangen, and educated at Nuremberg, Würzburg, Erlangen, and Munich. In 1862 he began to work on agricultural chemistry in Liebig's laboratory. In 1864–67 he taught in the Realschule at Memmingen and conducted agricultural experiments there and in 1867–76 was rector of the Lindau Realschule. He was director in 1876–86 of the first German dairy experiment station, near Lalendorf in Mecklenburg; in 1886–96 of the Agricultural Institute at Königsberg; and after 1896 of a similar institute at Göttingen. His most important work was in the chemistry of milk and in the history of agriculture. His writings include: *Handbuch des Molkereiwesens* (1876); *Altgermanische und altrömische Agrarverhältnisse* (1906); *Lehrbuch der Milchwirtschaft* (1908; and in English and Russian versions); *Cäsar, Tacitus, Karl der Grösse, und die deutsche Landwirtschaft* (1911).

FLEMAL, flà′màl′, or **FLEMAEL,** Bertholet (1614–75). A Flemish historical and portrait painter, born at Liége. He studied under Trippez and Girard Douffet and then went to Rome and Florence, where he lived for several years. Upon his return he stopped in Paris, where he decorated the churches of the Grands Augustines and the Carmes Déchaussés. In 1649 he was employed in Brussels for the Swedish Queen. During a second visit to Paris in 1670 he was elected a member of the Royal Academy and shortly afterwards professor, and painted the ceiling of the Audience Chamber in the Tuileries. He was also the architect for several churches at Liége. Flemal is one of the best masters of the Liége school. His pictures are well composed, but weak in color and show the influence of Poussin. But few survive, among the best of which are a "Crucifixion" in the cathedral, and paintings in several other churches in Liége; "The Punishment of Heliodorus," in the Brussels Museum; "Æneas Leaving Troy," in the Dresden Gallery.

FLÉMALLE, flā'mȧl', Le Maitre de. An important Flemish painter of the early fifteenth century, named from the Abbey near Liége where the first identified examples of his work were found. He is usually identified with Jacques Daret, a painter of Tournay, who is first mentioned in 1427 as a pupil of Robert Campin at Tournay at the same time as Rogier van der Weyden. Daret practiced chiefly at Tournay, where he was received into the painters' guild in 1432. He was active also at Lille (1454), Bruges (1468), and especially at Arras in 1433–35 and later. For the Abbot of St. Vaast at Arras he painted a large altarpiece, parts of which survive in the "Visitation" and "Adoration of the Magi," both in the Berlin Museum, a "Nativity" in the Morgan collection (Metropolitan Museum, New York) and the "Presentation in the Temple," the Tuck collection, Paris. He is last mentioned in 1468 as assisting in the festivals in honor of the marriage of Charles the Bold, Duke of Burgundy, at Bruges. But George Hulin de Loo has shown (*Burlington Magazine*, 1909, 1911) that Daret was probably a pupil of the Maître de Flémalle, who was no other than Robert Campin of Tournay. He was, after the Van Eycks, the most important master of his day. Technically his art was more archaic than theirs, but it possessed corresponding qualities of sincerity and naïveté. His most important work was a great triptych at Flémalle representing a "Descent from the Cross," of which four panels, viz., "The Holy Trinity," "Virgin and Child," "Gesinas on the Cross," and "St. Barbara," survive in the Städel Institute, Frankfort. Other panels by him are an "Annunciation with St. Joseph and Donors," Mérode collection, Brussels; "The Adoration of the Shepherds," Dijon Museum; a "Madonna and Child with Angels," Metropolitan Museum, New York; two small panels in the Johnson collection, Philadelphia; and "The Marriage of the Virgin" (1438) in the Prado (Madrid). Consult Houtart, *Jacques Daret* (Tournai, n. d.); Winckler, *Der Meister von Flémalle und Rogier von der Weyden* (Strassburg, 1913).

FLEM'ING, Abraham (c.1552–1607). An English poet and antiquary, born in London. He was educated at Cambridge, was chaplain to the Countess of Nottingham and afterward rector of St. Pancras, Soper Lane, London. Besides being an enthusiastic collector of old manuscripts, he was an excellent translator of Latin and Greek into English verse, to which he frequently added original matter. His work in prose includes a digest of Holinshed's *Chronicles* and a history of English earthquakes (1580).

FLEMING, John, Lord (c.1537–72). A Scottish lord, partisan of Mary Stuart. He succeeded to the title after the death of his brother James (1558), became Great Chamberlain in 1565 and Governor of Dumbarton Castle in 1567. He was with Mary at Langside and escorted her to Carlisle. She wished to send him to France, but Elizabeth would not permit this. Fleming withdrew to Scotland and held Dumbarton in Mary's name, in the hope of making an entrance possible for French troops; but the castle was taken in 1571. He escaped and went to France, but was shipwrecked on his return with French soldiers to take up Mary's cause. He was accidentally shot (1572) when the French entered Edinburgh. His son, John Fleming, was first Earl of Wigton; he died in 1619 and was succeeded by another John, who died in 1650.

FLEMING, John (1785–1857). A Scottish naturalist and preacher, born near Bathgate in Linlithgowshire. He was licensed as a minister, and preached in Fifeshire. He devoted most of his time, however, to the study of the natural sciences and by his scientific works soon became known as the first zoölogist of Scotland. In 1834 he was appointed professor of physics at Aberdeen. Afterward he filled the chair of natural history at Edinburgh. As a naturalist, he is best known as the originator of the so-called dichotomous or binary system of classification, which he endeavored to establish in spite of strong opposition on the part of Cuvier and others. He published a number of interesting works, including: *Economic Mineralogy of the Zetland and Orkney Islands* (1807); *Philosophy of Zoölogy* (1822); and a *History of British Animals* (1828).

FLEMING, John Ambrose (1849–). An English physicist and electrical engineer. He was born at Lancaster, Nov. 29, 1849, and received his education in the University College School and University College, London. He was appointed professor of mathematics and physics at the University College, Nottingham, but resigned in 1881 to become electrical engineer to the Edison Electrical Lighting Company. In 1882 he was elected a member of the Institution of Electrical Engineers, of whose council he was for many years a member, serving as vice president, and was also a vice president of the Physical Society of London as well as a member of the Royal Institution. In 1911 he was Hughes medalist of the Royal Society. Professor Fleming was chosen a fellow of St. John's College, Cambridge, and a fellow of the University College, London. While not giving up consulting and expert work entirely, Professor Fleming in 1885 accepted an appointment as professor of electrical engineering in University College, where a fine laboratory was erected under his direction and a complete course in electrical engineering given. He was also appointed Pender professor of electrical engineering in the University of London. He was largely interested in founding the National Physical Laboratory. His investigations in radiotelegraphy were of great importance, and he contributed much to the theory and practice of the art. He delivered many popular lectures and read many papers before scientific societies. He published: *Short Lectures to Electric Artisans* (1885); *Treatise on the Alternate Current Transformer* (1889–92); *Electric Lamps and Electric Lighting* (1894); *Electric Laboratory Notes and Forms* (1894); *Magnets and Electric Currents* (2d ed., 1902); *Waves and Ripples in Water, Air, and Ether* (1902); *The Principles of Electric Wave Telegraphy and Telephony* (1906); *A Manual of Radiotelegraphy and Radiotelephony* (1908); *Propagation of Electric Currents in Telephone and Telegraph Conductors* (1911); *The Wonders of Wireless Telegraphy* (1913).

FLEMING, Klas Eriksson (c.1535–97). A Swedish admiral and statesman. He was born in Finland, of a family originally from Flanders. In 1561 he was appointed Governor of Esthonia by Erik XIV. He fought against Duke John (1563), but later went over to him and was made a peer and counselor in 1569, after John's accession to the throne. In the next year he commanded the army which repelled the Danes. Because of his personal valor and his high place in the kingdom, as well as because of his relation to Gustavus Vasa, whose sister-in-law, Ebba Stenbock, he had married (1573), he exerted great influence. In 1588 he was made grand admiral, in 1591 he commanded in the war with Russia, and until 1597 he was practically Regent of Finland. On the death of John III (1592) Fleming upheld the claim of Sigismund against Duke Charles, and at the end of the war with Russia refused to dismiss his soldiers and went with his fleet to Danzig to fetch Sigismund to Stockholm. After Sigismund's coronation (1594) Fleming was made Governor of Finland. He put down two peasant insurrections in east Bothnia (1596–97) and was preparing to attack Duke Charles, when he died.

FLEMING, or **FLEM'MING**, PAUL (1609–40). A German poet. He was born at Hartenstein (Saxony), studied at the universities of Leipzig and Leyden, and in 1633–39 accompanied the embassy sent by Duke Frederick of Schleswig-Holstein to Moscow and Persia. His early work was in the manner of Martin Opitz (q.v.), whom he afterward greatly surpassed. He is not indeed wholly free from the volubility and artificiality characteristic of the verse of his time, but he displays more frequently than do his contemporaries sincerity and directness and easily outranks them all in poetic fervor. His collected poems, edited by his friend Adam Olearius, were published in 1646. The best subsequent edition is by Lappenberg (the Latin poems, 1863; the German, 2 vols., 1865) in Nos. 73, 82, and 83 of the *Bibliothek des litterarischen Vereins*. Consult also: Varnhagen von Ense, *Biographische Denkmale*, vol. iv (3d ed., Leipzig, 1872); Straumer, *Flemings Leben und orientalische Reise* (ib., 1892); Wysocki, *De Pauli Flemingi Germanice Scriptis et Ingenio* (Paris, 1892); Bornemann, *Paul Fleming* (Stettin, 1899).

FLEMING, RICHARD (c.1360–1431). A bishop of Lincoln, born in Yorkshire and educated at University College, Oxford. There he came under the influence of Wiclif's teachings, declared for them as member of the commission of 12 appointed to see if they were heretical, and was very severely reprimanded by Archbishop Arundel in the matter. But later, and especially as Bishop of Lincoln (1420), he showed himself a zealous upholder of papal authority, was president of the English representatives at the Council of Pavia (1423), and championed the power of the Pope above that of the Council. On his return to England he was appointed by the Pope Archbishop of York (1424), but the King had already granted that office to the Bishop of Worcester, duly elected by the chapter, and Fleming had to give up his claim. In 1427 he began to plan a new college at Oxford, especially to hinder the spread of heresy and error; but Lincoln College was not founded till after his death. He is best known in episodic history because he exhumed Wiclif's body, burned it, and threw it into the Swift. He is mentioned by Bale as author of *Super Angliæ Etymologia*, but this is lost if it ever existed.

FLEMING, SIR SANDFORD (1827–1915). A Canadian civil engineer, scientist, political reformer, and imperialist. He was born in Kirkcaldy, Fifeshire, Scotland, where he received his early education and first studied surveying. Coming to Canada in 1845, he joined the engineering staff of the Northern Railway and in 1857 became its chief. In 1863, while the settlers of the Red River valley (now part of Manitoba) were still living under the régime of the Hudson's Bay Company, he was chosen to urge the British government to promote railway communication between the Red River and eastern Canada. On his return he was appointed to survey the first part of a railway to extend from the Atlantic to the Pacific and wholly within British territory. The result was the Intercolonial Railway, of which he was chief engineer, and whose construction he completed in 1867–71. In 1872, as chief engineer of the Canadian Pacific, he led an exploring expedition across the continent to the British Columbia coast, and during 1873–77 he located the route of that railway through the Yellowhead Pass. While thus engaged, he also procured at his own expense surveys of Newfoundland which resulted in the railway afterward built and operated by Sir Robert Gillespie Reid (q.v.). These services made him the chief engineering figure in the continental railway construction so necessary to the political coherence of Canada. They were subordinate, nevertheless, to his aim of promoting consolidation of the Empire by linking the overland telegraphs on British soil to a system of all-British, state-owned submarine cables. In 1879 he submitted to the Canadian government a scheme for a British Pacific cable. Its essential features were adopted and subsequently realized in the cable completed in 1902, which connects Great Britain, Canada, Australia, and New Zealand. Fleming's imperialistic motive, while grounded on telegraphic communication as a means of defense, included also the unifying interchange of thought between the different parts of the Empire. Of this proof is afforded by the memorial tower near Halifax, built to commemorate the origin and benefits of Canadian representative government first established there. In 1880, when he retired from the service of the Dominion government, Fleming resumed his investigation of universal or cosmic time, with the object of establishing a standard system (see TIME, *Standard*) whose application to railway schedules would bring order out of confusion. His system was approved by various scientific societies, was sanctioned by international action at Washington in 1884, and has since been largely adopted throughout the world. In 1880 he became chancellor of Queen's University, Kingston, a position which he held continuously thereafter, being reëlected for another three years' term in 1914, when he was 87 years old. He was a delegate to the colonial conferences in London, 1887, and in Ottawa, 1894; also a delegate to several international scientific conventions, and a member of many learned societies. He was one of the founders of the Canadian Institute and in 1888 was president of the Royal Society of Canada. Although not identified with any political party, he took a deep interest in and wrote ably on questions of representation and electoral reform. In 1897 he was made Knight Commander of the Order of St. Michael and St. George. His publications include: *The Intercolonial: A Historical Sketch* (1876); *Daily Prayers for Busy Households* (1879); *Uniform Standard Time* (1881); *A Cable across the Pacific* (1882); *The Prime Meridian Question* (1884); *Expeditions to the Pacific* (1889); *Parliamentary vs. Party Government* (1891); *On the Rectification of Parliament* (1892); *An Imperial Intelligence Union* (1906); *A Memorable National Epoch* (1908); *The Beginning of the Empire* (1910).

FLEMING, Williamina Patton (Stevens) (1857–1911). An American astronomer. She was born at Dundee, Scotland, where she taught school from 1871 to 1876. In 1879 she became an assistant at the Harvard College Observatory, where she was appointed curator of astronomical photographs in 1898 and later took charge of the Astrophotographic Building. On plates exposed in 1897 and 1902 she found the spectrum of a meteor, and she is also known as the discoverer of new stars and variables. In 1906 she became an honorary member of the Royal Astronomical Society, London, and at Wellesley College she was an honorary associate in astronomy. She published *A Photographic Study of Variable Stars* (1907) and *Spectra and Photographic Magnitudes of Stars in Standard Regions* (1911).

FLEM'INGS. See Teutonic Race.

FLEM'INGSBURG. A city and the county seat of Fleming Co., Ky., 64 miles (direct) southeast of Cincinnati, Ohio, on the Cincinnati, Flemingsburg, and Southeastern Railroad (Map: Kentucky, G 2). It is in an agricultural region, has a trade in tobacco, poultry, and live stock, and manufactures tobacco, flour, lumber, etc. Pop., 1900, 1268; 1910, 1219.

FLEM'INGTON. A borough and the county seat of Hunterdon Co., N. J., 52 miles by rail west by south of New York City, on the Lehigh Valley, the Pennsylvania, and the Central of New Jersey railroads (Map: New Jersey, C 2). It is the commercial centre for a productive agricultural region and has manufactures of foundry and machine-shop products, shutters, vinegar, gloves, stoneware, flour, brick, and cut glass. There is a public library. Pop., 1900, 2145; 1910, 2693. As early as 1712 nearly all the land comprising the site of the present borough was owned by three proprietors, William Penn, Daniel Coxe, and Joseph Kirkbridge. During the Revolution Flemington was in some degree a centre for military operations, and in 1776 a skirmish took place here in which the British troops were routed.

FLEM'ISH LANGUAGE AND LITERATURE (Flem. *Vlaemsch*, Dutch *Vlaamsch*, OFris. *Flemsche, Flaemsche;* connected with Flem. *Vlaenderen*, Dutch *Vlaanderen*, Ger. *Flandern*, Flanders). The Low German language and literature of Belgium. The earliest history of the Flemish language is also the history of Dutch, the name specifically applied to the language of the Netherlands. The oldest stage of both is the dialect group called Old Low Franconian, spoken, from the seventh century to the middle of the twelfth, by various German peoples in the whole lower Rhine region, from the confluence of the Ruhr with the Rhine to the sea. When out of the popular dialects, in the second half of the twelfth and the beginning of the thirteenth century, a written language was developed, a number of dialect groups existed in what are now the Netherlands and Belgium that had an important bearing upon the subsequent formation of the language. Frisian (q.v.), at the beginning the principal dialect, was spoken in the territory farthest north and along the seacoast; Saxon, in the region about the Yssel; Franconian, on the Rhine. Out of Frisian and Saxon contact had arisen a Frisian-Saxon mixed dialect, which was spoken principally in territory subsequently Dutch, but also in a small part of West Flanders. Out of Frisian contact with Franconian, furthermore, had arisen a Frisian-Franconian mixed dialect. The territory of the latter, besides those parts subsequently Dutch, was East Flanders, west of the Scheldt and the Lys, and the greater part of West Flanders. Pure Franconian was spoken in territory subsequently Dutch, but also in East Flanders, east of the Lys and the Scheldt, in Antwerp, in South Brabant, and in Limburg. Each of the main dialects, in this way, contributed its quota to what was, in the end, to be the language of the Low German part of Belgium.

The first dialect which, as far as can be ascertained, developed a written language, was the Franconian of Limburg, in which Henrik van Veldeke, born in the neighborhood of Maastricht, wrote after the middle of the twelfth century. The oldest poems of the thirteenth century were written in Limburg, Brabant, Antwerp, and particularly in Flanders. They all exhibit local dialectic peculiarities, but there is visible in them, at the same time, the tendency towards a common literary form. The Flemish poet Jacob van Maerlant (c.1235–1300), the founder of the didactic school of poetry in the Netherlands, and sometimes called "the father of Dutch poets," in his *Leven van St. Franciscus*, names as dialects "Duutsch," by which he apparently means the dialect of Holland, Brabantish, Flemish, and Zealandish. His own work shows the striving, already indicated, to write a literary form, which tendency obviously continued during the succeeding centuries, down to the close of the middle period in the history of the language, at the end of the fifteenth century.

During the sovereignty of the dukes of Burgundy, which terminated in 1477, the language was subjected to French influence, which resulted not only in the introduction of a multitude of French words, but also in the loss of inflectional endings, and made the sixteenth century a period of linguistic confusion. The writers on language, of whom there were many at this time, endeavored each to make his own dialect the recognized literary form, and the dialect of Bruges, the East Flemish of Ghent, and the dialect of Brabant were in turn presented as forms of usage. Towards the end of the century, however, this had given way to the feeling that the common language should have more general characteristics and should represent the whole rather than any particular part. Pontus de Heuiter, who published, in 1581, at Antwerp, his *Nederduitse Orthographie*, said of his own language that it is "set together out of the speech of Brabant, Flanders, Holland, Guelders, and Cleves," and this was ultimately the common attitude.

The possibility of the development of a common literary language for the Netherlands and Belgium, which at this time, on account of the superior literary culture of Brabant and Flanders, bade fair to have a southern character, was definitely determined in the negative by the political events at the close of the sixteenth century. The northern provinces, in 1581, formally threw off their allegiance to the Spanish crown and, as the Dutch Republic, declared themselves an independent state. The centre of literary culture was presently shifted from the south to the north, and out of the dialect of the Province of Holland was developed the literary language of the Netherlands, called specifically Dutch.

The southern provinces were destined to a wholly different fate. After the taking of Antwerp, in 1585, by the Duke of Parma, the Belgian Netherlands (including Limburg, South Brabant, Antwerp, East Flanders and West Flanders, etc.) were separated from the northern provinces. They remained under Spanish supremacy until, in 1714, by the Peace of Rastadt, they were awarded to Austria. In 1794 they were conquered and annexed to France. During this whole period of foreign domination literature had sunk almost to its lowest possible ebb. The literary language, which at one time had made its influence felt over the whole of the Low Countries, remained fixed in its sixteenth-century form and was on the point of degenerating again into a mere dialect of the people. Its place as the language of the cultured classes, and particularly after the French occupation in 1794, had been taken more and more by French, already the sole language of the other Belgian provinces, Liége, Luxemburg, Namur, and Hainaut. The union of Belgium with Holland into the Kingdom of the Netherlands, in 1815, did not change existing conditions. Although the new sovereign, William of Orange, did his utmost to further the use of Low German in the place of French, his efforts were opposed both by the people, who from the standpoint of their own dialect regarded the language as a foreign tongue, and by the cultured classes, who would not thus differentiate themselves from the French-speaking provinces of the south. The revolution of 1830, which finally separated Belgium from Holland and in the end made it an independent European state, apparently settled for all time the fate of the Low German language. French became the single official medium; a literary language no longer existed in the Low German provinces, and the spoken dialects, with considerable local differences, alone held possession of the field.

A movement, known as the "Flemish movement," whose purpose was to rehabilitate Low German as the literary and official language, was, however, begun about 1830 and has ultimately been successfully carried through. Jan Frans Willems (1793–1846), who in the time of the United Kingdom had attempted without result to further the use of the native tongue, now set out, in the light of the awakening of the new spirit of nationality, after 1839, to accomplish this end. Under the influence of this movement poets like Karel Ledeganc (1805–47), Theodor van Rijswijck (1811–49), and Prudens van Duyse (1804–59), and prose writers like Hendrik Conscience wrote Flemish, and an active propaganda was made to bring the language back again into the place in which it once stood in the estimation of all classes of the community. The Belgian government, by the language laws of 1873, 1878, 1886, and 1897, gave to the movement the official sanction which was needed to complete it. By these enactments Flemish is made, with French, the legal and official language of the kingdom, the knowledge of which is required, and it is placed among the subjects of public instruction in the schools. The foundation of the Royal Flemish Academy (*Koninklijke Vlaamsche Akademie*), in 1886, was the final consummation of the movement.

The territory of the Flemish language at the present time is, generally speaking, the Belgian provinces of Antwerp, Limburg, Brabant, East Flanders, and West Flanders, the boundary between French and Flemish being approximately a straight line drawn from Liége southward of Brussels to Calais, although French is spoken in some places to the north and Flemish to the south of such a line. The Flemish language does not differ materially from Dutch, with which in the earliest period, as we have seen, it was coincident. The three centuries during which there was little connection between the northern and the southern Netherlands, and in which each went its own way, brought about differences, however, that, in spite of the unity that has been adopted in the orthography of Dutch and Flemish, still make the one readily distinguishable from the other. In addition to peculiarities of syntax, of idiom, and of the specific choice and meaning of words, Flemish is particularly characterized by the relatively large number of French elements in its vocabulary.

Flemish Literature. It is only with the Flemish movement, already mentioned, that the history of Flemish literature, in the strict sense of the word, begins. Before the nineteenth century the literature of Flanders was indistinguishable from Dutch. (See DUTCH LITERATURE.) The first real step towards a recognition of Flemish was made by the Academy of Brussels in 1772, which put this language on an equal basis with French and Latin. The movement was checked by the French occupation in 1794, and, as noted above, it was not until Jan Frans Willems appeared that Flemish became a literary language. As early as 1818 Willems set forth his views concerning the value of Flemish and its ancient history in his dissertation, *Sur la langue et la littérature néerlandaises, par rapport aux provinces méridionales des Pays-Bas.* The movement was actively supported by the government until 1830, when it received a temporary setback. Soon, however, the government returned to its policy of encouragement, and in 1836 commissioned Willems to publish the Middle-Flemish poem of *Reinaert de Vos*, which he had discovered. This was followed by other texts in rapid succession. At the same time a Flemish annual, *Nederduitsch letterkundig jaarboekje*, was being published by Rens and was in a flourishing condition. Other pioneers with Willems were David (1801–66), the founder of the review *De Middelaer*, Serrure, Snellaert, Blommaert, who founded the *Nederduitsche letteroefeningen*, an organ for new Flemish writers, and Bormans, of whom the last four collaborated in the *Belgsch Museum*, which was edited by Willems. One of the most important of the early Flemish writers was Karel Lodewijk Ledeganc, whose poetry marks an epoch in the history of the literature, in such contributions as his *Bloemen mijner lente*, and *De Hut in 't Woud*. He became later also a prose writer in his *De Zinnelooze* and *Vaarwel tot de jeugd;* but his masterpiece is the poem *De drie Zustersteden* (1846), in praise of Ghent, Bruges, and Antwerp, the three capitals of Flanders. The Middle Flemish literature, whose study had been begun by Willems, was continued ably by Serrure in his *Vaderlandsch Museum* (1855–61) and by

David, Bormans, and Snellaert. The most important of the early novelists was Hendrik Conscience (1812–83), whose masterpiece was his *Jacob van Artevelde*, published in 1850, but who was a most prolific author, writing no less than 71 books. He aroused national spirit by picturing the valiant struggles of the Flemings against the Spaniards. Theodor van Rijswijck returned to poetry, especially political and satirical, publishing *Oorspronkelijke Verhalen* and *Eppenstein*, and his masterpiece describing the Flemish aspirations, *Antigonus*. Contemporary with Van Rijswijck was Van Beers, the Romantic poet, famous for his *Levensbeelden*, *Gevoel en Leven*, and his long epic *Begga*. Following Conscience came a line of novelists, such as Delcroix, author of *Geld of Liefde* and *Philippine van Vlaanderen*, Sleeckx (1818–1901), who wrote *Volksverhalen*, *In 't Schipperskwartier*, *Op 't eksterlaar*, and *Dirk Meyer*, and Snieders (1812–88), well known for his *De gasthuisnon*. Romanticism found an exponent in Bergmann's *Verspreide schetsen en novellen* (written under the pseudonym of "Tony"). A new generation arose—one which had not to create, but to develop, a movement. Here are prominent the names of Dantzenberg, whose *Volksliederen* were followed by the poems of De Cort and Van Droogenbroeck. The novel, to which Conscience had contributed so copiously, also received fresh inspiration in Madame Courtmans (1811–90), who wrote 58 tales, of which the most important are *Roza van den Buschkant*, *Moeder Daneel*, *Het plan van Heintje Barbier*, *De Koewachter*, and *Het rad der fortuin*. Two poetesses, the sisters Rosalie (1834–75) and Virginie Loveling (b.1836), are important figures in the literature of Flanders; and their novels, such as *Broeder en Zuster*, *M. Damien en zijne erfgenamen*, by Rosalie, and *Sidon*, *Emiliaantje*, and *Octavie en Estelle*, by Virginie, are also worthy of note. Of the West Flemish authors the chief is the Abbé Guido Gezelle (1830–99), whose poems preach the piety of the Church militant in his *Dichtoefeningen* and his *Gedichten, Gezangen en Gebeden*. The drama has also been developed by the Flemish, who tend especially, like the Dutch, towards comedy. Especially noteworthy productions in this branch of literature are the *Meester en knecht* and *Zannekin* of Sleeckx, besides a large number of less important plays. Among the newest names in the various literary genres are Hilda Ram, Pol de Mont, Geyter, Cyril Buysse, Streuvels, Saabe, Woestijne, Baekelmans, De Clercq, Rooses, and De Potter.

Consult: Schuermans, *Algemeen Vlaamsch Idioticon* (Louvain, 1856–70); De Bo-Samyn, *West Vlaamsch Idioticon* (Ghent, 1892); Delepierre, *Sketch of the History of Flemish Literature* (London, 1860); Stecher, *Histoire de la littérature néerlandaise en Belgique* (Brussels, 1887); Arjuna, *Die vlämische Bewegung* (Cöthen, 1897); Hamelius, *Histoire politique et littéraire du mouvement flamand* (Brussels, 1894); the *Vlaamsche Bibliographie* of the Flemish Academy of Ghent, for publications between 1830 and 1890; Kurth, *La frontière linguistique en Belgique et dans le nord de la France* (2 vols., Bruxelles, 1895–98); Coopman, *Geschiedenis der vlaamsche letterkunde* (Antwerp, 1910). See WALLOONS.

FLEMMING, PAUL. See FLEMING, PAUL.

FLEMMING, PAUL. The chief character in Longfellow's *Hyperion*.

FLEMMING, WALTER (1843–1905). A German anatomist. He was born at Sachsenberg, Germany, April 21, 1843. He studied at Göttingen, Tübingen, Berlin, and Rostock. He was privatdocent in the last-named place in 1871 and in Prague in 1872 and after 1876 was professor of anatomy in Kiel. His contributions to the knowledge of the finer structure of the cell, and of the process of mitosis, are very important. He wrote: *Zellsubstanz, Kern und Zelltheilung* (1882); *Beiträge zur Kenntniss der Zellen und ihrer Lebenserscheinungen* (1879–81); *Studien über Regeneration der Gewebe* (1885); *Neue Beiträge* (1887–91).

FLENSBURG, flĕns'bụrk. A town in the northern part of the Prussian Province of Schleswig-Holstein, pleasantly situated at the end of the Flensburg Fiord, on the Baltic, about 40 miles northwest of Kiel (Map: Prussia, C 1). The buildings worthy of mention are the Marienkirche, the Nicholaikirche, the courthouse, and the theatre. The Flensburg Lion in the old churchyard dates from 1853 and was erected by the Danes to commemorate their victory. The old cemetery is noteworthy and contains a sphinx by Thorvaldsen. Educational institutions include a gymnasium, an agricultural school, a trade and navigation school, and a training school for marine machinists. The industries include shipbuilding, with large drydock facilities, the manufacture of iron and machinery, the production of paper, cloth, carpets, chalk bricks, glass, furniture, tobacco, smoked fish, cement, and vinegar. There are oil and rice mills. The city does a thriving trade in grain, chemicals, coal, lumber, coffee, sugar, horses, and fat cattle. The fisheries are productive. Flensburg is the official town of the circle. Pop., 1900, 48,937; 1910, 60,922. April 1, 1910, the communes Engelsby, Twedt, Twedterholz, were incorporated with the city; a fine monument to Kaiser Wilhelm II, by Haverkamp, was erected in the same year. The town dates from the twelfth century. Queen Margaret, founder of the Union of Kalmar, died here in 1412. Flensburg was captured twice in the Thirty Years' War and has suffered much from military campaigns. Severe battles were fought in its vicinity in the Schleswig-Holstein wars, and it was annexed with Schleswig to Prussia in 1864.

FLERS, flâr. A town in the Department of Orne, France, on the Vère, 41 miles by rail from Alençon (Map: France, N., E 4). It has an old castle, dating from the fifteenth century, a Norman church, a college, a commercial school, a library, museum, and a race track. There are manufactures of linen, fustian, damask table covers, shirtings, ticking, and dyestuffs. Pop. (commune), 1901, 13,680; 1911, 13,610.

FLESCH, KARL (1873–). A Hungarian violinist. He was born at Moson and studied violin under Grün at the Vienna Conservatory in 1886–89. From 1890 to 1894 he was a pupil of Marsick at the Paris Conservatory. He made his début as a virtuoso in 1895 in Vienna. In 1897 he settled in Bucharest, where he was professor at the conservatory from 1897 to 1902 and leader of the private quartet of the Queen of Rumania. In 1903 he accepted a call from the Conservatory in Amsterdam, where he remained till 1908. The phenomenal success of a series of five historical violin recitals in Berlin in 1909 induced him to settle in that city. Thereafter he devoted his entire time to concertizing and teaching privately. Both as a virtuoso and as a teacher he met with singular success. The publication of his famous *Urstudien* for violin (1910) at once placed him in the front rank of teachers. In 1913–14 he made a most successful concert tour of the United States. He also published masterly editions of the violin works of Mozart, Beethoven, Mendelssohn, Paganini, and Kreutzer.

FLESH (AS. *flæsc*, OHG. *fleisk*, Ger. *Fleisch*, flesh, Icel. *flesk*, pork). The ordinary term for the muscular portion of animal tissues. Numerous analyses have been made of the muscular substance of various animals. The following table gives the determinations of the individual constituents of beef freed as far as possible from blood vessels and may be regarded as fairly representing the composition of flesh generally:

CONSTITUENTS	Percentage amounts	
Water	From 75.00	to 77.00
Solid constituents	" 25.00	" 23.00
	100.00	100.00
The solid constituents include:		
Muscular fibre	From 13.00	to 18.00
Gelatinous substance	" 0.60	" 1.90
Albumen	" 2.20	" 3.00
Kreatin	" 0.07	" 0.14
Kreatinin	undetermined	
Inosic acid	"	"
Fat	From 0.50	" 3.00
Lactic acid	" 0.60	" 0.68
Phosphoric acid	" 0.66	" 0.70
Potash	" 0.50	" 0.54
Soda	" 0.07	" 0.09
Chloride of sodium	" 0.04	" 0.09
Lime	" 0.02	" 0.03
Magnesia	" 0.04	" 0.08

This list, however, does not include all the ingredients of flesh. In the freshly expressed muscular juice, which exhibits a strong acid reaction, we also find small quantities of proteids (myosin, muscle albumen, and hæmoglobin), acids (sarcolactic acid and acid phosphates), salts of potassium and sodium, mineral substances (phosphoric acid and potash), and extractives (either basic substances or amides, as kreatin, xanthin, carnin, and carnic acid—all representing the fragments of broken-down proteids and of no use as tissue builders). There are also found hypoxanthin and formic, butyric, and acetic acids (which may all be products of decomposition), uric acid, urea, and inosite (q.v.). Bernard discovered glycogen (q.v.) in the muscles of the embryos of various animals.

The dried flesh of the ox is practically identical in its ultimate composition with dried blood, as is shown by the following analyses, which were made by Playfair:

CHEMICAL COMPONENTS	Beef	Ox blood
Carbon	51.83%	51.95%
Hydrogen	7.57	7.17
Nitrogen	15.01	15.07
Oxygen	21.37	21.39
Ash	4.23	4.42

For further information on the subject, consult: Liebig, *Researches on the Chemistry of Food*, trans. by Gregory (Edinburgh, 1847); Hutchison, *Food and the Principles of Dietetics* (London, 1911); Blyth, *Foods: Their Composition and Analysis* (ib., 1909); Cocroft, *Foods, Nutrition and Digestion* (Chicago, 1912). See also bibliography under CHEMISTRY, PHYSIOLOGICAL.

FLESH BIRD, or **MEAT BIRD**. A name given in various parts of the world to birds that come about camps or ships and devour fragments of meat. In North America it refers to the Canada jay. See JAY.

FLESH FLY, BLOWFLY, or **MEAT FLY**. Any of several large, noisy, blue or green flies of the house-fly type, which lay their eggs on exposed wounds, meat, or carrion. A very conspicuous one is a large bluebottle fly (*Calliphora erythrocephala*), rather dull in color, with a rust-red forehead and black spines on the thorax. It is the common blowfly of Europe, whose maggots are called "gentles" and are used as bait by English anglers. Another familiar British species (*Sarcophaga carnaria*) is rarely seen in America, where its place is taken by a similar scavenger species (*Sarcophaga sarraceniæ*). A third well-known American species is the greenbottle (*Lucilia cæsar*), which often enters houses. This and the preceding species frequently lay their eggs in the putrid mass of insects caught by the plants of the flytrap (*Sarracenia*). In the Western States a most troublesome kind is the screw-worm fly (*Compsomyia macellaria*), which ranges throughout the warmer regions of both Americas and sometimes attacks wounds or diseased parts (as the nostrils) of men as well as domestic animals. Indeed, the evil effects of several sorts of flesh flies (including the small gray ones of the genus *Helicobia*) are referred to in medicine by the term "miasis." The stable fly (*Stomoxys calcitrans*) should also be mentioned here.

The breeding habits and life history of all these flies are essentially similar. The eggs are laid in packets on dead animals or upon raw or even cooked meat, each packet containing from 3 to 100 eggs. The instincts which guide the fly to just the food its larvæ will require are as precise as they are curious. Prof. Jacques Loeb records, in his *Physiology of the Brain* (New York, 1900), that where pieces of lean meat and of fat from the same animal were exposed together "the fly never failed to lay its eggs on the meat and not on the fat"; furthermore, he was unable to rear the larvæ on the fat. He believes the attraction and choice are due to chemitropism in the parent fly. The larva issues in from 20 to 24 hours, and buries itself in the carrion, feeding continuously for two weeks, when it crawls aside into some protected place and transforms to pupa, in which stage it remains from two days to several weeks. There are several generations each year, and the part which these insects play in the rapid removal of decaying carrion is very important. Unfortunately these insects also attack the fresh wounds of living animals with most injurious effects; and Packard states, in regard to *Calliphora vomitoria*, that it grievously tormented wounded soldiers on the battlefield during the American Civil War. Careful cleaning of infected wounds of animals with dilute carbolic acid, and covering them with a dressing of tar, are remedial measures. Consult Osborn, "Insects Affecting Domestic Animals," in *United States Department of Agriculture, Division of Entomology, Bulletin 5* (Washington, 1896). See FLY; TSETSE FLY.

FLESSELLES, fle-sĕl′, JACQUES DE (1721-89). A French official in the earliest days of the Revolution. He was master of requests and then became supervisor at Moulins (1762) and in Brittany (1765), where he sided with D'Aiguillon and De Saint-Florentin against Parliament and La Chalotais (q.v.). He showed himself a clever officer at Lyons, where he went in 1767, and became popular for his unwilling acquiescence in the policy of Turgot and later for his administration of the government in the "paternal" mode. He became Councilor of State in 1784 and was one of those blamed for the Pact of Famine, by which the people thought the government had combined with the grain merchants to raise the price of breadstuffs. In 1789 he was made provost of merchants of Paris—the last to hold this office, which was followed by the mayoralty (*mairie*). On July 13 he tried to organize a civic guard. On the 14th, after the taking of the Bastille, a note found on De Launay seemed to prove that he had attempted to deceive the people. The mob started with him to the Palais Royal, but he was shot on the way, his body horribly mutilated, and the head carried on a pike through the streets.

FLE′TA. The title of an ancient English law book, popularly attributed to one of the learned judges of the time of Edward III, but of wholly unknown authorship. Its title is supposed to be derived from the fact of its having been written in the Fleet Prison. It is one of a numerous class of legal textbooks, founded upon the great work of Bracton (q.v.), which appeared towards the close of the fourteenth century. It never had any considerable authority and is inferior in arrangement as well as in originality to the treatise attributed to Britton (q.v.), which was written at about the same time and with which it is often compared. Consult J. Sheldon's *Dissertation on Fleta*, R. Kelham, translator (London, 1771).

FLETCH′ER, ALICE CUNNINGHAM (1845-1923). An American ethnologist and worker for the betterment of the American Indians. She was born in Boston, Mass. In 1891 she was awarded the Thaw fellowship in the Peabody Museum of Harvard University, and as vice president of the American Association for the Advancement of Science (1896), president of the Anthropological Society of Washington, president of the American Folk-Lore Society and of the Archæological Institute of America (1879), she became widely known in American scientific circles. As a worker for the American Indians, she originated the plan whereby through small loans they are encouraged to buy land and build houses. In 1883-84 she served as United States special agent to allot the Omaha tribes their lands in severalty, and in 1887 she acted in the same capacity for the Winnebago and Nez Percé tribes. Tact, sympathy, and a just appreciation of the Indians enabled her to discharge all these missions successfully, and incidentally endeared her to the tribes for whom she worked. In 1893 Miss Fletcher was one of the judges in the anthropological department of the World's Columbian Exposition, and she was also appointed a member of the advisory board in the department of anthropology in the University of California. Her publications include monographs upon American ethnological subjects, such as *Indian Ceremonies* (1884) and *A Study of Omaha Indian Music* (1893), published by the Peabody Museum; *The Import of the Totem* (1897), published by the Smithsonian Institution; other monographs published by the United States Bureau of Ethnology; various articles in the *Anthropologist*, the *Folk-Lore Journal*, and *Science; a Report on Indian Civilization and Education*, published by the United States Senate; and *Indian Story and Song from North America* (1900), a unique collection of native music gathered from the Omaha, Pawnee, and other Western tribes, and accompanied by translations and explanatory texts, which has already borne fruit by suggesting American compositions.

FLETCHER, ANDREW (1655-1716). A Scottish patriot and publicist. He was born in Saltoun, East Lothian. His father, Sir Robert Fletcher, dying when his son was 10 years of age, committed him to the care of Gilbert Burnet, who superintended his education for five years. In 1681 he sat in Parliament as commissioner for East Lothian. Prior to this he had strongly opposed Lauderdale's policy and now offered a determined opposition to the test oath and to the Duke of York's oppressive measures. He was obliged to flee to Belgium; but fearing arrest by Spanish agents, he secretly returned to England, and after the Rye House Plot, in which he had counseled moderation, he joined the Duke of Monmouth in Holland. He landed with Monmouth's expedition at Lyme, Dorsetshire, but in a quarrel about a horse shot a local ex-alderman, a fellow campaigner, and fled to Spain for safety. The authorities imprisoned him when he landed; but he made a romantic escape and, after traveling in disguise through Spain, reached Hungary, where he fought as a volunteer against the Turks. He joined William of Orange at The Hague in 1688 and in the Revolution returned to Scotland. His policy was now to create a Scottish Home Rule party. After the Union he retired from public life and devoted himself to agriculture. Among his improvements was the introduction of winnowing fanners and of pot barley into Scotland. His polemical tracts, which appeared anonymously, were collected and published after his death. Consult: Fletcher, *Political Works* (London, 1732); Erskine, *Essays on the Lives and Writings of Fletcher of Saltoun and the Poet Thomson* (ib., 1792); Omond, *Fletcher of Saltoun* (New York, 1897); Burnet, *History of his own Time* (6 vols., Oxford, 1833); Dalrymple, *Memoirs of Great Britain and Ireland* (London, 1873); Wodrow, *History of the Sufferings of the Church of Scotland* (Edinburgh, 1842).

FLETCHER, BANISTER FLIGHT (1866-). An English architect, educated at University College, London, and at the Royal Academy. In 1888 he won the Architectural Association medal for design and in 1895 the Tite medal for architectural design. He was London University extension lecturer on architecture, vice president of the Architectural Association, and a partner, with his brother Herbert Phillips Fletcher (b. 1872), in the firm of Banister Fletcher and Sons, founded by his father, Prof. Banister Fletcher (1833-99), who wrote a well-known book on *Model Houses for the Industrial Classes* (1871). This firm built the King's College School, London, and had charge of additions and alterations on the Carpenters' Hall, London Wall, etc. B. F. Fletcher traveled widely, especially on architectural sketching tours, and wrote *A History of Architecture on the Comparative Method*, with his father (1896); with H. P. Fletcher, *Architectural Hygiene* (1899) and *Carpentry and Joinery* (4th ed., rev. and enlarged, 1914); *Andrea Palladino* (1902); *Architecture and the Humanities.*

FLETCHER, Benjamin. Colonial Governor of New York from 1692 to 1698. The date and place of his birth and the date of his death are not recorded. By profession a soldier, he served in the Low Countries and in Ireland, and in 1692 was appointed Governor of New York by William and Mary and also commander of the Connecticut military forces. In the same year he was directed to take over the administration of Pennsylvania and the territories on the Delaware, William Penn having been temporarily deprived of his proprietary rights. He was strongly opposed by the Leisler faction in New York and in religion by the Independents, who accused him of accepting bribes, interfering with elections, and encouraging piracy; he also quarreled with the Assembly over the right to appoint ministers in the province and over the granting of money. In 1698 he was replaced by Bellomont. For an account of his administration, consult Wilson, *Memorial History of the City of New York*, vol i (New York, 1892).

FLETCHER, Duncan Upshaw (1859–). An American legislator. He was born in Sumter Co., Ga., and was educated at Vanderbilt University (B.S., 1880). Admitted to the bar in 1881, he took up law practice at Jacksonville, Fla., but after 1893 he was most of the time in active political service—as member of the Florida House of Representatives (1893), mayor of Jacksonville (1893–95, 1901–03), chairman of the Democratic State Committee (1905–08), and United States Senator (1909–15). He became a trustee of John B. Stetson University, Deland, Fla., and identified himself with various other institutions.

FLETCHER, Frank Friday (1855–1928). An American naval officer, born at Oskaloosa, Iowa. After graduating from the United States Naval Academy in 1875, he passed through the different grades, becoming captain in 1908 and rear admiral in 1911. At various times he commanded the torpedo boat *Cushing*, the gunboats *Kanawha* and *Eagle*, the cruiser *Raleigh*, and the battleship *Vermont*. In 1910 he became aid to the Secretary of the Navy for the division of materials; in 1911 he was placed in command of the Fourth Division of the Atlantic fleet and later in command of the Third Division. He had charge of the naval forces which took possession of Vera Cruz, Mexico, in April, 1914—the first act of hostility on the part of the United States against Huerta. In June, 1914, he was selected to succeed Rear Admiral Badger as commander in chief of the North Atlantic fleet. He was also the inventor of the Fletcher gun mounts and breech mechanism.

FLETCHER, Giles and Phineas. English poets, cousins of John Fletcher (q.v.) the dramatist, and sons of Giles Fletcher, Queen Elizabeth's Ambassador to the court of Russia.—Giles (c.1588–1623), the younger of the two brothers, was educated at Cambridge and died at his living at Alderton, Suffolk. His chief poetical work is a sacred poem, entitled *Christ's Victorie and Triumph*, written and published at Cambridge (1610). It contains scattered passages of fine quality.—Phineas (1582–1650) was educated at Eton and Cambridge and became rector of Hilgay, in Norfolk, in 1621, where he died. His most important poem is the *Purple Island: or, the Isle of Man* (1633). It contains an elaborate description of the human body and mind, the former being given with great anatomical minuteness. The mind is represented as being beleaguered by the vices and likely to be subdued, when an angel comes to its aid. Although the poem is formal and pedantic in design, the thought and movement are at times majestic. The Fletchers are known as Spenserians, because they imitated to an extent the stanza and the theme of the *Faerie Queene*. On the other hand, they look forward to Milton, who read them carefully. Their works were edited by A. B. Grosart for the *Fuller Worthies Library* (1868). The Cambridge English Classics edition, *Poetical Works* (Cambridge, 1908–09), ed. by F. S. Boas, is excellent.

FLETCHER, Horace (1849–1919). An American author, lecturer, and food expert, born at Lawrence, Mass., and educated at Dartmouth College. He traveled widely and engaged in many lines of work, but after 1895 he paid particular attention to problems of sociology and to researches in human nutrition. His theories of the mastication of food gave rise to the cult of Fletcherism for which he is generally known. He lectured on vital economics in several institutions and became consulting editor of the *Christian Endeavor World*, the *Ladies' Home Journal*, and the *Good Health Magazine*. He was elected vice president of the Food Reform Society of England and president of the Health and Efficiency League of America. His writings include: *A B C of Snap Shooting* 1880); *Menticulture* (1895; 2d ed., 1903); *Happiness as Found in Forethought Minus Fearthought* (1897); *That Last Waif* (1898); *What Sense?* (1898); *Glutton or Epicure* (1899; 2d ed., 1903); *A B–Z our own Nutrition* (1903); *Optimism* (1908); *Fletcherism, or How I Became Young at Sixty* (1913).

FLETCHER, James (1852–1908). A Canadian botanist, born near Wrotham, Kent, England. He was educated at King's School, Rochester, England. In 1874 he went to Canada, where he was Dominion entomologist to the Department of Agriculture until 1887, when he became entomologist and botanist of the Dominion Experimental Farm at Ottawa. In the same year he became editor of the *Canadian Entomologist*. In 1886 he was elected a member of the Linnæan Society of London. In Canada he came to be known as "the farmer's friend" because of his successful work in devising methods of exterminating harmful insects. He published a "Flora Ottawaensis" in the *Transactions of the Ottawa Field Club*, vols. i–v (1880–84), continued in the *Ottawa Naturalist*, vols. ii–vii (1888 et seq.).

FLETCHER, John. See under Beaumont, Francis.

FLETCHER, or **DE LA FLECHERE,** John William (1729–85). An English clergyman and early supporter of Wesleyanism. He was born at Nyon, Vaud, Switzerland, and was educated at Geneva, where he distinguished himself in philology and philosophy. He afterward served as a captain in the Portuguese army, was tutor in an English family, and, although he had already shown his approval of the Wesleyan revival, in 1757 he took orders in the Church of England. After 1760 he was vicar of Madely, except that in 1768–71 he served as superintendent of the theological college founded by the Countess of Huntington at Trevecca, Wales. He was one of the stanchest supporters of John Wesley, who is said to have approved of Fletcher as his successor; but Wesley lived the longer. Fletcher's *Checks to Antinomianism* (5 vols., 1771) was the most important contribution to the Arminian side of the Calvinistic and Antinomian controversies. His *Appeal to Matter of Fact and Common Sense*, also noteworthy, had many editions. Unlike some of his contemporary controversialists, Fletcher never descended to vituperation; in fact, he was noted for his saintly character. The most important life is that by Luke Tyerman, entitled *Wesley's Designated Successor* (London, 1882). Others are by Wesley (ib., 1786), J. Benson (4th ed., ib., 1817), and J. Marrat (ib., 1902).

FLETCHER, Julia Constance ("George Fleming") (1858–). An American dramatic author and novelist. She was born in Brazil, the daughter of a missionary, and, after being educated in the United States and Europe, made her home in Rome. Among her works are: *The Head of Medusa* (1880); *Vestiga* (1884); *Andromeda* (1885); *For Plain Women Only: Dissertations on Feminine Interests* (1896). Her dramatic works include: *A Man and his Wife* (1897); *The Canary* (1899); *The Fantasticks* (1900); *The Light that Failed*, a version of Kipling's story (1903); *The Conquest*, from the French (1909); *The First Gentleman in Europe*, with Mrs. Frances Hodgson Burnett (1897).

FLETCHER, Phineas. See Fletcher, Giles and Phineas.

FLETCHER, Richard (c.1543–96). An English bishop, a courtier of Elizabeth. He was educated at Corpus Christi College, Cambridge, was prebend of Islington in 1572, married Elizabeth Holland in the following year, and in 1574 was minister at Rye and was presented to Elizabeth by Archbishop Parker. He was a good preacher and did so well in his attempts to please the Queen that he was made vicar of Bradenham (1575), court chaplain (1581), dean of Peterborough (1583), and prebendary of Stow Longa at Lincoln Cathedral, and rector of Barnack and of Algakirk (1586). He preached before Mary Stuart's judges and distinguished himself as chaplain at her execution by his bid for Elizabeth's favor. In 1589 he was made Bishop of Windsor, but lived most of his time at court. In 1592 his wife died. In the same year he was made Bishop of Worcester, and two years afterward became Bishop elect of London. But the Calvinism of the Lambeth Articles, which he helped frame, and still more his second marriage with a widow of small reputation, angered the Queen; he was forbidden to come to court and was suspended from office (1595). He left eight children, one the famous dramatist, John Fletcher.

FLETCHER, Robert (1823–1912). An American surgeon and anthropologist, born in Bristol, England. He graduated at the Royal College of Surgeons, England, in 1844, became surgeon of the First Ohio Infantry in 1861, surgeon of United States volunteers in 1863, and subsequently principal assistant librarian in the library of the Surgeon-General's office, Washington, D. C. He also served as lecturer (1884–86) and professor (1886–88) of medical jurisprudence in Columbian (later George Washington) University, and was president of the Anthropological Society of Washington. In 1910 he was awarded the gold medal of the Royal College of Surgeons, England. He wrote: *Paul Broca and the French School of Anthropology* (1882); *Human Proportion in Art and Anthropometry* (1883); *The New School of Criminal Anthropology* (1891); *Scopelism* (1897); *A Tragedy of the Great Plague of Milan in 1630* (1898); and he edited *Index Medicus*.

FLETCHER, William Isaac (1844–). An American librarian, born at Burlington, Vt., and educated in the public schools of Winchester, Mass. From 1883 to 1911 he was librarian of Amherst College, where he also taught library economy in the summer school for 14 years (1891–1905). In 1891–92 he served as president of the American Library Association. He was coeditor of *Poole's Index to Periodical Literature* (1882–1911), and editor of the *Coöperative Index to Periodicals* (1883–1911) and of the *American Library Association Index to General Literature* (1893, 1901). He also published *Public Libraries in America* (1895).

FLETT, flĕt, John Smith (1869–). A British geologist, born in Kirkwall, Orkney, and educated at Edinburgh University, where he became lecturer in petrology and assistant to Prof. James Geikie. He joined the British Geological Survey in 1900 and became petrographer to the Survey in 1902 and assistant to the director in charge of the survey of Scotland in 1911. He wrote many memoirs of the Survey; a *Report* (1902) for the Royal Society on the volcanic eruptions of the Soufrière in St. Vincent, which he studied with Dr. Tempest Anderson, and which they styled the "Peléan type"; and many technical papers, particularly on petrography.

FLEUR-DE-LIS, flẽr'-de-lē' (Fr., flower of the lily). Possibly a conventionalized form of the iris plant. As a motive in ornament, it goes back to the days of the Etruscans or earlier. It became the emblem of the kings of France after 1180. Many fanciful explanations are given to account for its adoption, but none has any authority. In 1376 Charles V fixed the form of the French king's coat of arms definitely, *Azure, à trois fleurs-de-lis d'or*, i.e., three golden fleurs-de-lis on a blue field. See Iris.

FLEUR D'ÉPINE, flẽr dȧ'pēn', Histoire de (Fr., History of Thorn Flower). A "conte," or highly romantic tale, written by Anthony Hamilton in the early part of the eighteenth century.

FLEUR ET BLANCHEFLEUR, flẽr ȧ blăNsh'flẽr'. See Flore et Blanchefleur.

FLEURIAIS, flẽ'rā-ȧ', Georges Ernest (1840–95). A French naval officer, born in Paris. After graduation from the Ecole Navale in 1857, he entered the French navy, and rose to be *capitaine de vaisseau* in 1883 and rear admiral in 1892. He served in Mexico in the forces fighting for Maximilian and during the Franco-Prussian War was successively aid-de-camp to Admiral Bonet-Willaumez, commanding the North Sea squadron, and a soldier in the Army of the Loire. During the war against China, in 1884–85, he commanded the armored cruiser *La Galisonnière*. He was at various times intrusted with important scientific missions, such as the determination of certain meridians by lunar observations (1867–70), and the observation of the transit of Mercury at Payta, Peru (1878). He received, in 1874 and 1882, the Prix Lalande and the Prix Plumey respectively, for improvements made by him in instruments of navigation, and is best known for perfecting the gyroscopic horizon.

FLEURIEU, flẽ′rė-ẽ′, Charles Pierre Claret Comte de (1738–1810). A French naval officer, born in Lyons. He entered the French navy in 1751; in 1768–69 was commander of the *Isis* in an expedition sent out for the trial of the chronometer, or marine watch, in whose invention he had assisted Berthoud, and in 1776 became inspector general of navy yards and ports, so that his was the general supervision of the French navy during the War for American Independence. In 1790–91 he was Minister of the Navy, in 1800 was appointed by Napoleon to the Council of State, and later became successively senator (1805), admiral (1806), and Governor of the Tuileries (1808). He was Minister Plenipotentiary for the signing of the treaty by whose terms Louisiana was ceded to the United States. He published *Voyage fait par ordre du roi pour éprouver les horloges marines* (2 vols., 1773) and *Découverte des Français en 1768 et 1769 dans le sud-est de la Nouvelle-Guinée* (1790).

FLEURUS, flẽ′rụs′. A small town of Belgium, in the Province of Hainaut, situated near the left bank of the Sambre, and 15 miles west of Namur. Fleurus has been the scene of at least four important battles. Here, on Aug. 29, 1622, the German Protestant army, under the Duke of Brunswick and Count Mansfeld, repulsed the Spaniards under Cordova. On July 1, 1690, the French under Marshal Luxembourg defeated a coalition of Spanish, Dutch, and Germans. On June 26, 1794, the French under Jourdan, after an obstinate and bloody conflict at Fleurus, forced 80,000 of the Austrians and their allies, under the Prince of Saxe-Coburg, to retreat from the Sambre and to evacuate Flanders, thereby saving France from invasion. On June 16, 1815, Napoleon defeated the Prussians near Fleurus, though the battle is better known as the battle of Ligny (q.v.). Pop., 1911, 6600.

FLEURY, flẽr′ĭ (from Fr. *fleuré*, flowered, from *fleur*, flower, from Lat. *flos*, flower). A term in heraldry signifying that an object is adorned with fleurs-de-lis or parts of the fleur-de-lis; written also, flory, flowry, fleurette, etc. A cross fleury is a cross the ends of which are in the form of the fleurs-de-lis and is distinguished from a cross patonce in that the limbs in the latter are in the form of the segments of a circle and terminate in a mere bud, whereas the cross fleury has the limbs straight and the ends distinctly floriated. See Heraldry.

FLEURY, flẽ′rė′, André Hercule de (1653–1743). A French cardinal bishop and chief Minister during the early part of the reign of Louis XV. He was born June 26, 1653, at Lodève in Languedoc, and after an excellent education at Paris entered the Church and became a canon at Montpellier. In 1679 he was called to be almoner to Marie-Thérèse, wife of Louis XIV, and here laid the foundation of his immense fortune. After her death he became royal almoner (1683) and received many preferments, including the abbey of Rivour and the bishopric of Fréjus. In 1715, in accordance with the dying wish of Louis XIV, Fleury became tutor to the young Louis XV, then only five years old, over whom he succeeded in establishing a complete ascendancy. When the King reached his majority, Fleury was made a member of the Council of State, although he refused to accept the ministry. Nevertheless he wielded enormous power indirectly. His ecclesiastical policy was inimical to the Jansenists. The Duc de Bourbon attempted to struggle against his influence, but only succeeded in bringing about his own dismissal in 1726. Fleury thereupon became virtually Prime Minister, though he did not assume that title, and contented himself with the dignity of Cardinal, which he received in the same year. By strict economy and a wise internal policy Fleury raised France from a state of commercial depression. He effected great reductions in expenses and developed commerce and agriculture without increasing taxation, though he did revive some of the unpopular peasant taxes. Methods of communication developed to an extraordinary extent during his administration. His religious policy tended greatly to increase the power of the Jesuits and to convert the Jansenists into a political party. But he was unfortunate on the whole in his external policy, which embraced the play of politics attendant upon the Polish and Austrian wars of succession. The last of these wars he did not live to see terminated, for he died while still in office, in 1743, at the age of 90. One of the most praiseworthy acts of his administration was the completion of the Bibliothèque Nationale at Paris. He was a scholarly man himself and a member of the various French academies. Consult: Lacretelle, *Histoire du dix-huitième siècle* (Paris, 1830); Verlaque, *Histoire du cardinal Fleury* (ib., 1879); Perkins, *France under the Regency* (Boston, 1892).

FLEURY, Claude (1640–1723). A French church historian, born in Paris. He was educated by the Jesuits and at first practiced law (1658–67), but, preferring an ecclesiastical career, took priest's orders and became tutor to the young princes of Conti (1672) and later (1680) to the Comte de Vermandois, natural son of Louis XIV. After the death of the Count, the King appointed him, in 1684, abbot of the Cistercian Monastery of Loc-Dieu and in 1689 tutor to the royal grandchildren, the dukes of Burgundy, Anjou, and Berri. In 1696 he was elected to the Academy and in 1706 became prior of Argenteuil. The Duke of Orleans appointed him confessor to the young King, Louis XV, in 1716, and he held this office till compelled to resign by the infirmities of age in 1722. Fleury was a man of much learning, kind-hearted and simple in manners, and upright in conduct. Of his numerous works may be mentioned: *Les mœurs des Israélites* (1681); *Les mœurs des Chrétiens* (1682); *Traité du choix et de la méthode des études* (1675); *Institution du droit ecclésiastique* (1687); and, most important of all, the *Histoire ecclésiastique* (20 vols., 1691–1720). This work was the labor of 30 years and is marked by learning and a judiciously critical spirit. J. H. Newman prepared an English translation of the part from the Second Ecumenical Council (Oxford, 1842–44). Fleury's part extends only to 1414, but his continuators have brought it to 1546 in the Paris edition of 1836–37. In the Latin translation (Augsburg, 1758–94) it is continued to 1768. The so-called *Abrégé de l'histoire ecclésiastique de Fleury* (Bern, 1766) has a preface by Frederick the Great. He was a stanch Gallican, and his posthumous work, *Discours sur les* *libertés de l'église gallicane* (1724), has been very popular. His *Complete Historical Catechism*, continued to Pius IX, appeared in London (1871). For his biography, consult the Paris edition of his works (1837), and Hefele, *Der Kirchenhistoriker Fleury* (Tübingen, 1864).

FLEURY, Emile Félix, Comte (1815–84). A French general, born in Paris. He became a volunteer in the Spahis in Algeria in 1837, fought bravely, and became captain in 1844. He took an active part in the coup d'état of 1851. In the following year he organized the regiment of the *Guides*, of which he became commander. In 1856 he was promoted to the rank of brigadier general, became chief aid-de-camp to the Emperor, and, in 1865, senator. In 1866 he was sent as Ambassador to Florence and in 1869 as Ambassador to Russia, where he attempted to get aid against Germany. In 1870, when the Empire fell, he retired. He wrote *Souvenirs, 1837–67* (2 vols., 1897–98), largely a defense of the policies of Napoleon III, and *La France et la Russie* (1902).

FLEURY, François Louis Teisseidre, Marquis de (1749–94). A French soldier, who served in the American army during part of the Revolutionary War. He was born at Saint-Hyppolite in Languedoc, served in Corsica in 1768 and 1769, and in 1776 came to America for service in the Patriot army. He became a captain of engineers in May, 1777; had a horse killed under him at Brandywine; with John Laurens tried to fire the Chew House at Germantown; was appointed brigade major to Pulaski in October, 1777; in November was wounded at Fort Mifflin (q.v.), where he was engineer in chief; was promoted to be lieutenant colonel in the same month; was second in command of a picked corps of 600 men in the battle of Monmouth; served under Sullivan in Rhode Island, and at the beginning of the campaign of 1779 was placed in command of a regiment of light cavalry. In July, 1779, the Continental Congress voted him a silver medal for his gallantry at Stony Point, where he led the right column, was the first person to enter the fort, and tore away the British flag with his own hands. Late in 1779 he returned to France, but subsequently took part in the siege and capture of Yorktown. In December, 1781, he received the rank of Chevalier of St. Louis, and he ultimately attained the rank of *maréchal de camp* in the French army, having served in Pondicherry. There is a good brief sketch in Balch, *The French in America*, pp. 125–128 (Philadelphia, 1895).

FLEURY, Jean François Bonaventure (1816–94). A French teacher and author, born at Vasteville. He was educated at Cherbourg as bursar, then became a journalist, but after the coup d'état of December 2 he devoted himself to teaching. In 1858 he went to Russia as a private tutor and later was in public education. In 1872 he became professor at the St. Petersburg School of Law, and a little afterward reader in French in the university. He returned to France about 1890. Among his works mention should be made of the following: *Vie de Bernardin de Saint Pierre* (1843); *Krylov et ses fables* (1862); *La grammaire en action* (1864); *Essai sur le patois normand de Hague* (1866); *Histoire élémentaire de la littérature française* (2 vols., 1867; 22d ed., 1903); *Rabelais et ses œuvres* (2 vols., 1877); *Marivaux et le Marivaudage* (1881); *Littérature populaire de la Basse Normandie* (1883). Fleury's daughter is the novelist known as Henry Gréville.

FLEURY, Maurice de (1860–). A French physician, born at Bordeaux and educated in the University there. He was on the staffs of the hospitals of Bordeaux and later at Paris. He specialized in nervous complaints. His writings include: *Contribution à l'étude de l'hystérie senile*, a doctoral thesis (1890); *Traitement rationnel de la neurasthénie* (1894); *Pathogénie de l'épuisement nerveux* (1896); *Introduction à la médicine de l'esprit* (1897); *L'Ame du criminel* (1899); *Le corps et l'âme de l'enfant* (1899); *Manuel pour l'étude des maladies du système nerveux* (1904); *Nos enfants au Collège* (1905); *Brévaire de l'arthritique* (1912).

FLEURY DE CHABOULON, de chȧ′bo͞o′lôɴ′, Pierre Alexandre Edouard, Baron (1779–1835). A French legislator and secretary of Napoleon I. He was scarcely 16 when he became commander of a battalion of the National Guard. After serving in the Ministry of Finance and as an auditor of the Council of State, he was subprefect of the Department of the Meurthe. His services attracted the attention of Napoleon, who in 1814 appointed him auditor at army headquarters and subsequently sent him as prefect to Rheims, which he placed in a state of defense against the allied armies. Upon the return of Napoleon from Elba he became his private secretary. Banished after the Emperor's final deposition, he went to London, where he wrote his celebrated *Mémoires pour servir à l'histoire du retour et du règne de Napoléon en 1815* (2 vols., 1819, new ed., 1901; Eng. trans., 1820; Ger. trans., by Bergk, 1821). He returned to France, became Councilor of State under the July Government (1830), and also a deputy in 1834.

FLEURY-HUSSON, ụ′sôɴ′, Jules. See Champfleury.

FLEX′NER, Abraham (1866–). An American educator, born at Louisville, Ky., brother of Simon Flexner. He was educated at Johns Hopkins (A.B., 1886), Harvard (A.M., 1906), and Berlin universities. After many years of educational work,, beginning in 1886 as a teacher in the Louisville High School, he was from 1908 to 1912 expert to the Carnegie Foundation for the Advancement of Teaching, and then became assistant secretary of the General Education Board. He became a fellow of the American Association for the Advancement of Science. Besides contributions to the educational press, he is author of *The American College* (1909); *Medical Education in the United States and Canada* (1910); *Medical Education in Europe* (1912); *Prostitution in Europe* (1914).

FLEXNER, Simon (1863–). A distinguished American pathologist and bacteriologist, born at Louisville, Ky., brother of Abraham Flexner. He graduated from the University of Louisville (M.D., 1889) and also studied at Johns Hopkins, Strassburg, and Berlin universities. From 1891 to 1899 he was associate professor and professor of pathological anatomy at Johns Hopkins and from 1899 to 1904 professor of pathology at the University of Pennsylvania. In 1900 he was also pathologist to the University and Philadelphia hospitals and in 1901 director of the Ayer Clinical Laboratory of the Pennsylvania Hospital. He took charge in 1903 of the laboratories of the Rockefeller Institute for Medical Research, New York, where he did much important work—he announced in 1913 that he had discovered the germ of infantile paralysis. He is author of papers on the bubonic plague, bacillary dysentery, cerebrospinal meningitis, snake venom, infectious diseases, and various other subjects. Both Harvard and Yale conferred upon him the honorary degree of D.Sc., and in 1914 he was decorated with the cross of Chevalier of the Legion of Honor. In 1914 he was president of the Association of American Physicians.

FLEX'URE (from Lat. *flexura*, curve, from *flectere*, to bend). This term denotes the bending of loaded beams. If a beam, supported at its two ends, be loaded, it bends, its lower surface becoming convex and its upper concave. In this bending the fibres in the lower surface are stretched, and those in the upper are compressed, while between these surfaces there is one called the "neutral" surface, wherein the fibres are neither stretched nor compressed. Experiments show that the flexure of solid beams supported at their ends and loaded varies (1) directly as the load, (2) inversely as the product of their *breadths* and the cube of their *depths*, and (3) directly as the cube of the distance between the supports. Since flexure is primarily a phenomenon of stretching and compression, the coefficient of elasticity involved is Young's modulus. See Elasticity; Strength of Materials.

FLICK'EL, Paul (1852–1903). A German landscape painter, born in Berlin, pupil of Theodor Hagen at the School of Art in Weimar. He worked independently at Düsseldorf and from 1876 in his native city. His views of Italy, which he visited in 1877, depicting especially the luxuriance of southern vegetation, and all his landscapes, for which later he selected scenery near the coast of the Baltic and in the Harz Mountains, are remarkable for beautiful sunlight effects. A "Beech-Wood Near Prerow" was awarded the great gold medal at Berlin in 1886 and is now in the National Gallery, Berlin. Among others may be noted "The Ilse Valley in the Harz" (1888), "Sylvan Solitude" (1892).

FLICK'ER (onomatopoetic, from the bird's note). The popular name of one of the commonest and handsomest birds in the eastern United States, the golden-winged woodpecker (*Colaptes auratus luteus*). It is a little more than a foot in length, and the bill, which is 1½ inches long, is slender and somewhat curved, very unlike the ordinary woodpecker's bill. The back is olive brown, barred with black, while the rump and upper tail coverts are pure white; the top of the head and the sides of the neck are ash, with a bright scarlet nuchal band; the under parts are lilac brown anteriorly, fading into creamy yellow posteriorly, marked with numerous circular black spots; a broad, black crescent crosses the breast; the wings and tail are on the underside bright golden yellow. When the bird flies, the white rump is very prominent and makes the recognition of the flicker easy. This beautiful woodpecker is found throughout North America, as far west as Alaska, but in the United States it is confined to the country east of the Rocky Mountains. In the northern part of its range it is migratory, but it winters from Massachusetts and Illinois southward. It nests, like all woodpeckers, in holes in trees, and the eggs are white, five or more in number. When the nest is robbed, the female will continue to lay, until sometimes a great number have been deposited. In one case 71 eggs were laid in 75 days. The flicker feeds on worms, insects, and berries, and is often seen on the ground in search of food. The notes are varied, but the most familiar is a rapidly repeated, rolling call. There is also a frequent two-syllabled note, uttered in a high, nasal tone. The flicker enjoys the distinction of having more numerous popular names than any other American bird. No less than 36 have been recorded, the most common of which, besides the two already given, are high-hole, or high-holder, referring to the position of the nest; pigeon woodpecker, referring to the size and appearance on the ground; clape and yucker, which, like flicker, are supposed to imitate one of its notes; and yellow-hammer, referring to the color of the undersurface of the wings and its woodpecker habit of drumming on dead limbs.

The red-shafted flicker (*Colaptes cafer*, or *mexicanus*, *collaris*), west of the Rocky Mountains, is much like the common flicker in color, except that the underside of the wings and tail is orange red, and there is no red nuchal band; in habits it is exactly like the Eastern bird. A third species occurs in the valley of the Colorado River and southward, and three other species of the genus are found in the warmer parts of America.

Consult: Coues, *Birds of the Northwest* (Washington, 1874); Ingersoll, *Wild Life of Orchard and Field* (New York, 1902); Dawson, *The Birds of Washington* (Seattle, 1909). See Woodpecker; and Plates of Woodpeckers and of Eggs of Song Birds.

FLICK'INGER, Daniel Kumler (1824–1911). An American divine. He was born at Sevenmile, Ohio, and from 1857 to 1885 was secretary to the United Brethren Church Missionary Society, on behalf of which he made numerous tours in Africa. He became foreign missionary Bishop of the United Brethren in 1885. He wrote: *Offhand Sketches of Men and Things in Western Africa* (1877); *Ethiopia: or, Twenty Years of Missionary Life in Western Africa* (1877); *The Church's Marching Orders* (1879); *Fifty-five Years of Ministerial Life* (1907).

FLIEDNER, flĕt'nĕr, Theodor (1800–64). A German Protestant philanthropist. He was born at Eppstein, Nassau, the son of a clergyman, and after studying at the universities of Giessen and Göttingen, became pastor of a small church at Kaiserswerth in 1822. He made a tour through Germany, Holland, and England to raise funds in behalf of his poor parish, and his success suggested to him the idea of his benevolent institutions and especially prison reform. In 1826 the first Society for Prison Reform of Germany was founded. In 1833 Fliedner opened at Kaiserswerth a refuge for discharged female convicts. To take care of the sick and poor, a hospital was built and a body of women trained for nursing. In 1835 he founded an infant school in Düsseldorf and in 1836 one in Kaiserswerth with a normal training school. In the latter year he founded also the first German Protestant establishment for deaconesses. King Frederick William IV of Prussia, and his Queen, Elizabeth, gave Fliedner their support and founded a Christian hospital with deaconesses at Berlin. His last years were spent in founding "mother houses" in Europe, America, and the East, and he wore out his life in his work. The sterner features of his character were relieved by a humor that had full play in his intercourse with the children of his schools. Consult Winkworth, *Life of Pastor Fliedner of Kaiserswerth* (trans., London, 1867), and the biography in German by his son (Kaiserswerth, 3d ed., 1892).

FLIEGENDE HOLLÄNDER, flē̆′gen-de hôl′-lĕn-dẽr, DER (Ger., *The Flying Dutchman*). An opera by Wagner (q.v.), first produced in Dresden, Jan. 2, 1843; in the United States, Nov. 8, 1876 (Philadelphia).

FLIES, SPANISH. See BLISTER BEETLE.

FLIGELY, flē-gā′lē, AUGUST VON (1811–79). An Austrian soldier, born at Janow, Galicia. He was director of the Military Geographical Institute at Vienna from 1853 to 1872 and president of the Austrian Geodetic Commission until 1875. His work in the department of triangulation, geodesy, and cartography was very important, and the Military Geographical Institute of Austria owes its present fame to his influence and activity. The employment of heliogravure in the preparation of the new special atlases of Austria was due to his initiative. A cape in Franz Josef Land and a fjord in Greenland were named in his honor.

FLIGHT (AS. *flyht*, from *flēogan*, Icel. *fljūga*, OHG. *fliogan*, Ger. *fliegen*, to fly). The power of progressing through the air by means of wings. It is possessed by bats and birds among existing vertebrates, by the extinct pterodactyls, or flying reptiles, and by a very large proportion of insects. No amphibian can fly, the nearest approach to flight being found in a frog (*Rhacophorus*) of Borneo, in which the webbed feet are so large as to serve the purpose of a parachute. That flying fishes actually "fly" has been asserted and denied with equal vigor; but very careful observers insist that the pectoral fins are not active but merely passive agents in sustaining the fish after it has sprung into the air, although, when a flying fish is laid on the deck of a vessel, the outstretched fins are often vibrated with great rapidity and considerable force.

Mechanism for Flight. The wings of vertebrates are modifications of the fore limbs; these in bats and pterodactyls support, or supported, a thin membrane, while in birds the bones support stiff feathers. In bats the thumb is free, the bones corresponding to the fingers of man greatly elongated. The membrane is not only spread between these, but continued from the little finger to the ankle joint, while there is, in addition, a greater or less amount of membrane sustained between the legs and tail, which helps support the body during flight. In pterodactyls the thumb was absent, the succeeding three fingers very small, the fifth or little finger enormously elongated. This supported the wing membrane in front, while the hinder margin reached to the ankle joint, or possibly in some species only to the hip. In birds the bones of the hand are reduced in number, and some of them are fused, to furnish a point of attachment for the feathers. In bats the strain of the wing is sustained by the greatly developed collar bone, or clavicle, which runs from the shoulder blade to the front end of the breastbone and furnishes a firm brace for the shoulder joint. The clavicle is absent in pterodactyls, and the shoulder joint is formed by the shoulder blade and a bone termed the coracoid, the two uniting to form a V, with the socket for the wing at the apex. One arm of the V rests against the backbone, the other against the front part of the breastbone, thus forming an extremely firm brace for the wing. In birds (see BIRD) the shoulder joint is also formed by the shoulder blade and coracoid, but the shoulder blade runs backward, parallel with the body, the coracoid being attached to the front of the breastbone. This forms the most important support of the wing, for while the collar bones are present in the shape of the wishbone, they are by no means so important as is often supposed and, as in many small birds, may be of no use at all. The collar bones are strong and serve to brace apart the shoulders in birds like hawks and eagles, whose vigorous movements demand an extra strong support for the wing; but in humming birds and swifts the wishbone is feeble, although these birds have extraordinary powers of flight.

In *insects* the wings may be two or four in number, most commonly the latter, and, unlike the wings of vertebrates, they are not modified limbs, but specially developed parts believed by some to have been derived from the breathing organs of primitive aquatic forms. They are formed of thin, rather stiff membrane, braced by little ridges, termed "nerves," which are strongest on the front edge of the wing. This strengthening of the front margin is as absolutely essential as that the posterior portion should be flexible; any injury to this part of the wings destroys the power of flight, and flight is also impossible when the wing is made rigid. But a considerable part of the hinder portion of the wing may be removed without seriously impairing the ability to fly.

Flight Muscles. As in insects the hard parts are outside of the muscles, the wings are attached to the exterior of the body, and are not supported by an internal skeleton. The wings of vertebrates are moved by powerful muscles attached to the breastbone, and the depth of this portion of the skeleton is a rough measure of the muscular power used in flying. In such flightless birds as penguins, the breastbone is deeply keeled because the wings are used for swimming and moved by the muscles employed by other birds in flight. Among dragon flies the muscles are fastened directly to the base of the wings, much as in vertebrates; but in insects generally the wings are moved not only by these direct muscles, but by powerful cross muscles, which alter the curvature of the body and by so doing raise or depress the wings.

Modes of Flight. Broadly speaking, there are two modes of flight: (1) by repeated strokes of the wings; and (2) by gliding or sailing with outstretched, almost motionless, wings; but almost every intermediate condition is to be met with. The humming bird and albatross represent the extremes of these methods; the former moves the wings so rapidly that they are invisible, while the latter sails for long periods without a movement of its pinions. The common chimney swift is an excellent and familiar example of an intermediate state, vibrating its wings rapidly for a few strokes and then sailing.

The first method calls for a rather short and strongly built wing and large muscles; the second for a long wing and very little expenditure of muscular energy. The wings of the albatross are from 10 to 12 feet from tip to tip, and but 9 inches broad, while the muscular power of the bird is so slight that it cannot rise from the water when gorged with food. It is of interest to note that the long, narrow wing is the one which, in theory as well as in practice, is best for sailing. Contrary to what might be supposed, the support of the wing is stronger in sailing birds than in others, reaching the maximum of strength in the frigate bird, which, though noted for its power of long-sustained flight, has very small muscles. Birds of prey exhibit a combination of the two methods of flapping and sailing, and their wing muscles are so powerful that they are able to carry away birds almost as heavy as themselves.

Birds that sail must obtain their initial velocity either by darting from some elevated place, by strokes of the wings, or by strokes of the wings aided by the wind, which they face when taking flight. (See below.) The albatross cannot rise from the deck of a vessel, and when taking wing on a calm day is obliged to flap along the water for a considerable distance. Once in the air the sailing bird utilizes to the utmost the momentum first acquired, and it is probable that the ever-changing force and direction of the wind is an important factor in sailing, the bird instinctively making use of every variation in the currents of air. As bearing on this it may be said that the system of muscles by which the movements of the outer parts of the wing are controlled is much more complex in sailing than in flapping birds.

Insects resemble humming birds in the comparative lack of flexibility in their wings and mode of flight, while, owing to the small size of the wings and the slight contractions of the muscles that drive them, they are moved with almost inconceivable rapidity, the smaller the wing the more frequent being its strokes. Thus, while the large moths and butterflies flutter slowly, the wings of the house fly, according to Marey, vibrate 330 times per second.

Bats, the only group of flying mammals, also fly entirely by means of wing strokes, the frequency of the stroke being in an inverse ratio to the size of the species, the small bats fluttering, the large fruit bats flapping their wings somewhat like a heron. The length and narrowness of the wings of pterodactyls, and the small surface for muscular attachment, indicate that these creatures sailed or flew with infrequent wing strokes, after the fashion of a chimney swift.

Relation of Size and Weight to Flight. It is an interesting question whether or not the animals that fly represent the limits of size and weight attainable by living creatures. The albatross, condor, swan, bustard, turkey, and pterodactyl represent the maximum of weight, but these range only from 15 to 30 pounds, and the spread of wings is but 7 feet in the swan, 8 to 10 feet in the condor, and 10 to 14 feet in the albatross. The largest examples of pterodactyls had a spread of wing of 20 feet; but owing to the small size of the body and wonderful lightness of the skeleton, their weight at the outside was not more than 30 pounds. These reptiles, with their great expanse of wing, offer one of the exceptions to the general rule that the wing area per pound is proportionally less in large flying animals than in small—a seeming anomaly which, though imperfectly understood, is partly based on the fact that the great sweep of a large wing makes it much more effective than one of small dimensions. Very erroneous ideas prevail both as to the power of the muscles and the speed attained by birds. Marey long ago showed that the contractile power of the muscular fibres was certainly no greater in birds than in mammals, and observation has shown that even ducks, which fly very rapidly, seldom attain a greater speed than 35 to 40 miles an hour, although under favorable conditions some species may exceed this.

Flight of Birds. So long ago as 1680 an Italian, Borelli, propounded a theory of flight which in its essential feature holds good to-day. Noting that all wings are rigid in front, flexible behind, he considered that, as the wings were raised and lowered they formed obliquely directed planes alternately facing backward and forward, by which the bird was, so to speak, wedged through the air. More recently Professor Pettigrew, of England, and Professor Marey, of France, have studied the flight of birds, the latter in particular devoting much attention to the subject and devising very elaborate experiments to ascertain the action of the wings. Professor Marey was able to photograph the position of the wing at different phases of the stroke. This shows that the wing is not merely moved up and down, but that it has a variety of movements by which, combined with the resistance of the air, the wing assumes a somewhat twisted shape. According to Marey, the movements of the wing in a pigeon are briefly as follows:

At the commencement of the downward stroke the wings are spread to the utmost and brought downward and forward until their tips are in advance of the head. At the beginning of flight the downward movement is so great that the wing tips touch, while on their recovery they strike above the bird's back, producing the clapping sound so noticeable when pigeons take flight. The wing is now raised rapidly and at the same time flexed at the wrist joint, to be again straightened as the wings are raised to their full extent. In performing these motions the long axis of the wing describes an ellipse, being carried first forward and downward, then backward and upward. During the downward stroke the front edge of the wing looks downward, the undersurface of the wing being directed backward, these positions being exactly reversed during the upward stroke. It will be seen that by this disposition the wing has a propelling force during the downward stroke, while during the recovery, or upward movement, it acts as an inclined plane to raise the bird. There is, nevertheless, a rising and falling of the body, more or less pronounced, at every stroke, so that the forward path of the bird is not a perfectly straight line. Professor Pettigrew insists that during the downward stroke of the wing its undersurface is directly *forward*, and that the long axis of the wing describes a figure ∞ at each stroke, and that the wing, by this screwlike action, acts much after the fashion of a propeller; but the results obtained by photography do not seem to bear out this theory.

The method of sailing flight is less easily explained because the results obtained seem out of all proportion to the force expended. Having obtained its initial velocity, the bird is held to avail itself of every increase or upward eddy of the wind to rise, although in doing this onward movement is checked. The bird then sails forward and downward, to rise again and repeat these movements. Soaring, or ascending in spirals, is performed by this method, aided by upward currents of air. The difficulty in the way of this theory is that birds progress for long distances almost horizontally, while we cannot suppose that convenient upward currents are everywhere to be met with. But the experiments of Lilienthal have shown how little force is necessary for gliding flight, since by jumping from an elevation he was able, with the aid of wings of his invention, to sail for upward of a quarter of a mile. For power of long-distance flight, see MIGRATION OF ANIMALS.

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FLIGHT INTO EGYPT, THE. A subject frequently treated by painters, especially during the Renaissance. It represents Joseph, the Virgin, and the infant Jesus, fleeing into Egypt to escape the persecutions of Herod. The Virgin, with the Child in her arms, is usually mounted on the ass led by Joseph, and sometimes angels or other figures are introduced. Well-known examples are by Giotto, in the Lower Church at Assisi and the Arena Chapel, Padua; Claude Lorrain, in the Dresden Gallery; Rubens, in the Louvre; Tintoretto, in the Scuola di San Rocco, Venice; Van der Werff, in The Hague; and two by Murillo, in the Musée Galliéra, Paris, and the Hermitage, St. Petersburg. A variation of the same subject, "Repose on the Flight to Egypt" (or "Repose in Egypt"), is depicted with equal frequency. In this case the Madonna is usually seated under a tree with the Christ child in her lap, while Joseph secures dates from a neighboring palm. Good examples are those by Gerard David in the J. P. Morgan collection (Metropolitan Museum, New York); by Albrecht Altdorfer in the Munich Gallery; Correggio in the Parma Gallery and the Uffizi, Florence; Van Dyck, in St. Petersburg, Pitti Palace (Florence), and Munich Gallery; Murillo, in St. Petersburg and the collection of the Earl of Strafford; Paul Veronese, in Munich; Poussin, in the Louvre; and Delaroche, in the Wallace collection, London.

FLIGHTLESS BIRDS. Certain groups and species of birds lack the power of flight. Such birds fall into two categories: (1) ratite birds; and (2) groups or isolated species among carinate birds distinguished from their fellows by this disability. The ratite birds (see RATITÆ) form a primary group, comprising the moa, epiornis, and other fossil or extinct forms, and the existing kiwis (*Apteryx*), ostriches, cassowaries, emus, and rheas. They are distinguished as a class by the fact that the median line of the breastbone is not produced into an elevated ridge or "keel," as is the case with all other, or carinate, birds, where this keel is required to give attachment to the great pectoral muscles that move the wings. It is believed, however, that the ratite birds are a modified, not to say degenerate, offshoot from the primitive carinate stock, originating at a very early day in adaptation to life upon open plains, where, from lack of enemies or for some other reason, the use of the wings was less advantageous than ability in other directions and consequently disappeared. Such birds are now denizens almost exclusively of plains and deserts. See CASSOWARY; KIWI; MOA; OSTRICH; and similar titles.

In the case of the other category various circumstances seem to have brought about the flightless condition. In some, indeed, it is only partial, while others have completely lost the use of their wings for flying. Among the latter are the penguins, in which the wings have been converted into paddles, an adaptation to the requirements of a pelagic bird whose prey is caught under water; the same was true of the extinct great auk (see GAREFOWL); and in the Mesozoic hesperornis the loss extended to a complete disappearance of any external wings whatever. Another striking example is furnished by the extinct dodo and solitaire (qq.v.) of Mauritius and Rodriguez islands, whose wings had become small and totally useless, owing, it is believed, to the fact that through innumerable generations these birds had found no advantage in their possession, but rather a disadvantage in the prevailing high winds which often made it unsafe to fly much above the trees lest the birds be blown to sea. A fact parallel with this is the wingless condition on these islands of various insects belonging to classes that are elsewhere in full possession and use of their wings. A precisely similar instance, also, is found in a rail isolated on the island of Tristan d'Acunha, which has lost the power of flight and whose wings have nearly disappeared. (See RAIL.) Another curious instance of the flightless condition is afforded by an extinct goose (*Cnemiornis calcitrans*) of New Zealand, remains of which are found in that country, but the epoch to which they should be referred is uncertain, probably the Pleistocene. The duck *Nesonetta*, confined to the Auckland Islands, near New Zealand, is a similar case. Harris's cormorant is another of the several further examples which might be cited of the effect of isolation (q.v.) on islands as affecting flight. It is an inhabitant of the Galapagos Islands. See HESPERORNIS.

FLINCK, GOVAERT (1615–60). A Dutch genre and portrait painter. He was born in Cleves, Jan. 25, 1615, and was at first placed with Lambert Jacobs, a Mennonite preacher and painter of Leeuwarden. This was the home town of Saskia, wife of Rembrandt, and through her relatives he learned of the great master at Amsterdam and became his pupil. In his earlier works he followed Rembrandt so closely that their paintings are difficult to distinguish. Establishing a studio at Amsterdam in 1636, he became well known as a portrait painter, and received many official commissions. The arrangement of his compositions is good; the treatment is broad, with warmth of color in the flesh tones; the pose of the heads natural and full of animation. But after about 1648 his art visibly deteriorated—he abandoned Rembrandt's style, strove to imitate the ample forms and exaggerated action of Rubens, and adopted a mannered academic mode of painting. He died at Amsterdam Feb. 2, 1660, leaving a large collection of antiquities, drawings, and engravings valued at 12,000 florins. Excellent examples of his early manner are "Isaac Blessing Jacob" (1638), in the Museum of Amsterdam; the "Regents" (1642), and "The Company of Orange" (1645), both in the City Hall, Amsterdam; "Celebration of the Peace of Münster" (1648), Museum of Amsterdam, considered by many his masterpiece; "Expulsion of Hagar," Berlin Museum. The two important works of his later period are "Solomon Asking for Wisdom" and "Curius Dentatus Refusing the Presents of the Samnites," both in the Royal Palace, Amsterdam. Among his best portraits are "Man with a Gray Beard" (1639, Dresden); "Man with his Sister" (1646, Rotterdam); "A Young Man" (Hermitage, St. Petersburg). He is represented by other pictures in the galleries of Berlin, Dresden, Munich, Vienna, Brussels, in the Louvre, and elsewhere. He enjoyed the patronage of the Elector Frederick William of Brandenburg and of Maurice of Nassau, Stadtholder of Cleves, who often visited his house. Consult Havard, *L'Art et les artistes hollandais*, ii (Paris, 1880), and Van Dyke, *Old Dutch and Flemish Masters* (New York, 1901).

FLIN'DERS, MATTHEW (1760–1814). An English navigator and hydrographer, born at Donington, Lincolnshire. He studied geometry and navigation by himself and in 1789 entered the royal navy as a midshipman. After active service in European waters and in the West Indies he was attached in 1795 to the *Reliance* on which Captain Hunter, the Governor of New South Wales, had taken passage to Australia. Flinders spent five years on that continent, devoting the greater part of his time to geographical discoveries and coast surveys. He circumnavigated Tasmania in a small sloop and made exact geographical observations and calculations regarding the island. He was promoted a lieutenant in 1798 and on his return to England was placed in command of the ship *Investigator*, with instructions to return to New Holland, as Australia was then called, and complete a systematic survey of its coast. Flinders sailed from England in the *Investigator* on July 18, 1801, and, beginning with Cape Leeuwin on the southwest coast, spent the following two years in mapping the coast line east and northward as far as the Gulf of Carpentaria on the north coast. Being unable to complete the survey of the west coast, owing to the unseaworthiness of the *Investigator*, he started to return to England in a small ship; but having unfortunately stopped at Mauritius on his way, he was detained there a prisoner for six and a half years. Released at length, he returned to England broken in health and completed the account of his voyage and discoveries only a short time before his death. He was promoted to the grade of captain in 1810. Flinders ranks as one of the world's greatest hydrographers, and his survey of the Australian coast still forms the basis for the modern charts. He was also the first successfully to investigate the errors of the compass due to the attraction of iron in a ship. His account of his voyage was published in the year of his death (1814), under the title *A Voyage to Terra Australis* (2 vols., with atlas). Consult also a "Memoir" in the *Naval Chronicle*, vol. xxxii (London, 1815).

FLINDER'SIA (Neo-Lat., named in honor of Capt. Matthew Flinders). A genus of trees of the family Rutaceæ. One species, *Flindersia australis*, yields a heavy, hard, and often dark timber that is inferior to mahogany. It is much used in Australia and is there called Flindosa ash, or crow's ash. The tree is of rather rapid growth, specimens 100 to 150 feet in height and 4 to 6 feet in diameter being reported. *Flindersia oxleyana*, a tree 150 feet high, furnishes a light yellow wood and is considered one of the finest Australian hardwoods for cabinet work. A yellow dyestuff is also prepared from this species. *Flindersia maculosa*, called leopard tree, is a smaller species, the timber of which is used for shingles, barrel staves, etc. A gum that exudes from this tree in considerable quality resembles gum arabic and makes good mucilage. *Flindersia australis* is said to be a valuable street tree in the tropics. Its fruits are rough and according to Maiden are used as rasps in preparing roots, etc., for food. See OXLEYA.

FLIN'DERS LAND (named in honor of Captain Flinders). The name early given to South Australia, but now confined to Flinders County.

FLINDERS PETRIE, W. M. See PETRIE.

FLINDO'SA. See FLINDERSIA.

FLING, FRED MORROW (1860–). An American historical writer, born at Portland, Me. He graduated from Bowdoin College in 1883 and from the University of Leipzig (Ph.D., 1890). In 1891 he became professor of European history at the University of Nebraska. He founded the Association of Nebraska Teachers of History in 1897 and became one of the electors to the Hall of Fame. Besides many papers on historical subjects, he is author of *Outline of Historical Method* (1898); *Studies in Greek Civilization* (1898); *A Source Book of Greek History* (1907); and these important works on French history: *History of France*, in the "History of the Nations Series" (1907); *Source Studies on the French Revolution* (1907); *The Youth of Mirabeau* (1908); *Source Problems on the French Revolution* (1913).

FLING, HIGHLAND. See HIGHLAND FLING.

FLINS DES OLIVIERS, flăn dā zō'lē'vyā', CHARLES LOUIS MARIE EMMANUEL CARBON DE (1757–1806). A French poet, born in Rheims. He was King's officer for some time at Vervins and wrote there a poem *Voltaire* (1779). Under the pseudonym Louis Emmanuel he wrote *Les voyages de l'opinion dans les quatre parties du monde* (1789–1800). His other works include: *Les amours avec un essai sur la poésie érotique* (1780); *Poèmes et discours en vers* (1782); *Plan d'un cours de littérature* (1784); and the comedies *La jeune hôtesse* (1792), which was imitated from Goldoni's *Locandiera; Le mari directeur* (1791); and the cleverly planned *Le réveil d'Epiménide* (1790).

FLINT (AS. *flint*, OHG. *flins*, dialectic Ger. *Flins;* probably connected with Gk. πλίνθος, *plinthos, brick*). A massive variety of quartz somewhat similar to chalcedony, but usually of dark colors, as gray and brown. It is generally found in the form of nodules in deposits of chalk, especially in the chalk cliffs of England. It is of wide occurrence and is found chiefly in the counties of Kent, Norfolk, and Suffolk, England, where it was formerly used as a building material, and in Cretaceous limestones of the United States. Microscopic examination of flint shows that it contains spicules of sponges and frustules of diatoms, which have suggested that these served as a nucleus around which the silica was deposited from solution. According to Pliny, Clias was the first to strike fire with flint, and its use for sharp weapons and cutting instruments such as axes, arrowheads, knives, etc., is evident from its discovery among the earliest prehistoric relics. The readiness with which it produces fire when struck with steel leads to its extensive use for igniting tinder and its employment as gun flints; but these uses have been superseded by matches and percussion caps, and its principal application at present is as an ingredient of fine pottery, for which purpose it is calcined, thrown into cold water, and then finely powdered. Consult: Evans, *Ancient Stone Implements, Weapons, and Ornaments of Great Britain* (London, 1872); Stevens, *Flint Chips* (ib., 1870); Wilson, "Arrowpoints, Spearheads, and Knives of Prehistoric Times," in *Report of United States National Museum for 1897.*

FLINT. The capital of Flintshire, Wales; a seaport and municipal borough since 1284, on the estuary of the Dee, 13 miles southwest of Liverpool (Map: Wales, C 3). Only vessels of small draft can enter its port. It is a smoky little town, possessing lead and coal mines, copper and chemical works. Pop., 1901, 4279; 1911, 5472. Roman relics and traces of Roman lead-smelting works have been found. Flint was made a borough by Edward I, who built the castle, which still exists, but in a ruined state. Richard II, on Aug. 19, 1399, surrendered to Bolingbroke at Flint Castle, and in 1647 the fortress was captured by the Parliamentarians, who dismantled it four years later.

FLINT. A city and the county seat of Genesee Co., Mich., 72 miles by rail north-northwest of Detroit, on Flint River, and on the Pere Marquette and the Grand Trunk Western railroads (Map: Michigan, F 6). It is the seat of the State institution for the deaf and dumb, and among other features are Oak Grove Hospital, a private retreat for the insane, fine high school and Federal buildings, a public library, courthouse, and city hall. The city is one of the most important centres in the United States for the manufacture of automobiles, buggies, carriages, and varnishes, and has also flouring mills, grain elevators, ironworks, electric-stove works, cigar factories, brick and tile works, etc. It trades extensively in grain. Flint, then known as the Grand Traverse of the Flint, was settled in 1820 and in 1855 was chartered as a city. It owns its water works. Pop., 1900, 13,103; 1910, 38,550; 1914 (U. S. est.), 49,546; 1920, 91,599.

FLINT, ALBERT STOWELL (1853–1923). An American astronomer. He was born at Salem, Mass., and was educated at Harvard (A.B., 1875) and the University of Cincinnati (A.M., 1880). He served as computer of the United States Naval Observatory in 1881–83 and 1888–89 and as assistant to the United States Transit of Venus Commission in 1883–88. At the University of Wisconsin he was assistant astronomer of the Washburn Observatory from 1889 to 1904, when he became astronomer. He became a fellow of the American Association for the Advancement of Science. He is author of *Meridian Observations for Stellar Parallax*, vol. xi of the *Publications of Washburn Observatory* (1902).

FLINT, AUSTIN (1812–86). An American physician, born at Petersham, Mass. He was educated at Amherst and Harvard and graduated at the latter in 1833. After practicing in Boston and Northampton, he removed to Buffalo, N. Y., in 1836. He was appointed professor of the institutes and practice of medicine in Rush Medical College, Chicago; resigned after one year, in 1846, and established the *Buffalo Medical Journal.* With White and Hamilton he founded the Buffalo Medical College in 1847, where he was professor of the principles and practice of medicine for six years. He was afterward professor of the theory and practice of medicine in the University of Louisville, Ky., from 1852 to 1856. He was then called to the chair of pathology and clinical medicine at Buffalo. From 1858 to 1861 he was professor of clinical medicine in the School of Medicine at New Orleans. In 1859 he removed to New York and in 1861 was appointed visiting physician to Bellevue Hospital; from 1861 to his death, in 1886, he was professor of the principles and practice of medicine in Bellevue Hospital Medical College (consolidated with the medical department of New York University in 1898), and from 1861 to 1868 he was professor of pathology and practical medicine in Long Island College Hospital. He was president of the New York Academy of Medicine from 1872 to 1885 and president of the American Medical Association in 1884. His published works include: *On Continued Fever* (1852); *Chronic Pleurisy* (1853); *On Dysentery* (1853); *Physical Exploration in the Diagnosis of Diseases of the Respiratory Organs* (1856; revised 2d ed., 1868); *Diseases of the Heart* (1859; 2d ed., 1870); *Principles and Practice of Medicine* (1866; revised 5th ed., 1884); *Medical Essays on Conservative Medicine and Kindred Topics* (1874); *Clinical Medicine* (1879); *On Phthisis* (1883); *Manual of Auscultation and Percussion* (revised 3d ed., 1883). Consult his biography, by Carpenter (New York, 1886).

FLINT, AUSTIN (1836–1915). An American physician, born at Northampton, Mass., son of Austin Flint (q.v.). He attended medical lectures at the University of Louisville from 1854 to 1856 and in 1856 and 1857 at Jefferson Medical College, Philadelphia. From 1857 to 1859 he was editor of the *Buffalo Medical Journal*, surgeon of Buffalo City Hospital, and professor of physiology and microscopical anatomy in the University of Buffalo. In 1859 he removed to New York with his father and was appointed professor of physiology in New York Medical College. He was professor of physiology in the New Orleans Medical College in 1860 and studied in Europe in 1860 and 1861. He was professor of physiology and microscopic anatomy in Bellevue Hospital Medical College, New York City, from 1861 till this institution was consolidated with the medical department of New York University in 1898, when he was appointed professor of physiology in Cornell University Medical College. He was, in 1874, Surgeon-General of New York State. He carried out extensive experimental investigations in human physiology and made several important discoveries. He assisted in establishing the glycogenic function of the liver; showed that one of the functions of the liver is to separate from the blood the cholesterin, which is a product of the nervous system, and which, becoming a constituent of the bile, is afterward converted into what he named "stercorin," the odorous principle of the fæces. His principal works are: *The Physiology of Man* (4th ed., 1888); *Chemical Examinations* *of Urine in Diseases* (6 eds., 1870–84); *Effects of Severe and Protracted Muscular Exercises* (1871); *Source of Muscular Power* (1878); *Text-Book of Human Physiology* (1875); *Experiments Regarding a New Function of the Liver, Separating the Cholesterin of the Blood and Eliminating it as Stercorin* (1862); *The Physiology of the Nervous System* (1872); *Mechanism of Reflex Nervous Action in Normal Respiration* (1874); *The Treatment of Diabetes Mellitus* (1884); *Chemical Examination of the Urine in Disease* (1893); *Stercorin and Cholesteræmia* (1897); *Handbook of Physiology* (1905).

FLINT, Charles Ranlett (1850–). An American merchant and banker, born at Thomaston, Me. He graduated from the Brooklyn Polytechnic Institute in 1868. As a partner in Gilchrist, Flint & Co. and W. R. Grace & Co. he became interested in South American commerce. In 1877–79 he was Consul for the Chilean government in New York and later Consul General of Costa Rica and Nicaragua to the United States. In 1885 he became a member of the firm of Flint & Co., established by his father and uncle in 1837, and in 1889–90 he was a delegate to the International Conference of American Republics. He sold 20 submarines and torpedo boats to Russia and fitted out a fleet of war vessels for Brazil in 1895. In the following year he established the Coast Clipper Line, in 1897 he superintended the consolidation of the Syracuse street railways, and at the beginning of the Spanish-American War he negotiated the purchase of additional warships for the United States. He also became known as the organizer of various corporations.

FLINT, Joseph Marshall (1873–). An American surgeon, born in Chicago. He studied at Princeton, graduated from the University of Chicago (B.S., 1895) and from Johns Hopkins (M.D., 1900), and also studied in Leipzig, Vienna, Bonn, and Munich. He served as an assistant in anatomy in 1897 and associate in 1900–01 at the University of Chicago and as assistant to the Johns Hopkins Medical Commission to the Philippines. After special work for the United States Marine Hospital Service at San Francisco he was professor of anatomy at the University of California from 1901 to 1907, when he was appointed to the chair of surgery at Yale. He also became attending surgeon of the New Haven Hospital and chief surgeon of the New Haven Dispensary. From 1903 to 1907 he edited the *American Journal of Anatomy*, contributing, besides, to other medical journals articles on anatomy and surgery.

FLINT, Robert (1838–1910). A Scottish theologian, born in Dumfriesshire. He studied at Glasgow University, from 1859 to 1864 was pastor at Aberdeen and Kilconquhar, and was professor of moral philosophy and political economy in St. Andrews University (1864–76) and then professor of divinity in Edinburgh University. He was Stone lecturer at Princeton University in 1880, Croall lecturer at Edinburgh in 1887–88, and a foreign correspondent of the French Institute. His works include: *Christ's Kingdom on Earth* (1865); *Philosophy of History in Europe* (1874); *Theism and Anti-Theistic Theories* (1877), possibly his most important work and typical of his intuitionalism; *Historical Philosophy in France* (1894); *Socialism* (1894); *Sermons and Addresses* (1899); *Agnosticism* (1903); *Philosophy as Scientia Scientiarum* (1904); *On Theological, Biblical, and Other Subjects* (1905).

FLINT, Timothy (1780–1840). An American author, born at North Reading, Mass. He was a graduate of Harvard, and then a Congregational pastor until 1815, after which for 10 years he was a missionary and teacher in the Mississippi valley. Then, with little health and fortune left, he took up editorial work on the *Cincinnati Western Review*, and the *Knickerbocker Magazine* (1833), and devoted himself to the writing of his novels and other works relating to the West and Southwest. He resided at Alexandria, Va., in the winter and in New England in the summer. The best of the novels is *Francis Berrian* (1826), a tale of Mexico. His *Recollections of Ten Years Passed in the Valley of the Mississippi* (1826) was also popular, and he wrote geographies and lectures on natural history, did some translating, and furnished the London *Athenæum* with an early account or résumé of American literature. Altogether, he was an important man in his day, though now forgotten. He had a curious experience in his Massachusetts parish, somewhat recalling the fate of Gerbert, except that his ignorant parishioners thought that his chemical researches proved him to be a counterfeiter, not the Devil. Consult J. E. Kirkpatrick, *Timothy Flint, Pioneer, Missionary, Author, Editor* (New York, 1911).

FLINT GLASS (so called because the silica used in its manufacture was first derived from *flint*). A glass whose chief constituents are the silicates of lead and potassium. It has an index of refraction of 1.62–1.63 for yellow (sodium) light, and on account of its greater dispersive power is used in combination with crown glass in the construction of achromatic prisms and lenses. See Glass; Achromatism.

FLINT IMPLEMENTS. These products of handiwork are interesting to the archæologist, the technician, and the ethnologist. The word "flint" must be taken to mean siliceous stones that may be flaked and fashioned into implements. For the latter word students have substituted the term "artifacts." Not only tools and weapons, but ornaments, art treasures, and objects used in cults and ceremonies were made of flint from Point Barrow to Fuegia in America, and everywhere in the Old World, excepting in places that do not furnish materials. The sources of material were the open fields, bowlder beds, and exposures of undisturbed rock. The savages camped near the larger supplies, and first with hammers knocked off coarse spalls, then finer chips; finally, with pointed implements of bone, using pressure, they acquired marvelous skill in flaking the refractory materials into the desired shape. Much of the last-named process, however, was done at their homes. These ancient workshops are among the most interesting of remains, since they reveal the steps in the earliest of human industries.

Flint artifacts of the implement class pierce, cut, and abrade. They were arrow, lance, spear, and harpoon heads, and bits for drills; those of the edge class were knives and saws; the abraders were scrapers for the men and skin dressers for the women. In those regions where calcareous flint, beautiful varieties of quartz, jaspers, carnelian, and obsidian abound, the æsthetic sense was awakened and stimulated. In public museums and private collections will be found tiny arrowheads perfectly made, and immense ceremonial spearheads over a foot long, having their surfaces finished exquisitely. Flint artifacts are one of the chief concerns of the archæologist. At the present time this class of artifacts excites unusual interest. The history of prehistoric Europe is written chiefly in them; Egypt reveals an age of chipped flint antedating all the Pharaohs; from India come products of great beauty in this art; the occurrence of rude forms in the Quaternary deposits of western Europe is held to have thrown far back the life of man on the globe. The literature of the subject is vast and almost hopelessly scattered. Fortunately the *Journal of the Anthropological Institute*, of London; the *Bulletin de la Société d'Anthropologie*, of Paris; the *Zeitschrift für Ethnologie*, of Berlin; the Bureau of American Ethnology and the United States Museum in Washington have each issued a catalogue with up-to-date index of the subject. The *American Anthropologist* has a bibliography in each number. Besides these works, consult: Mortillet, *Le préhistorique* (Paris, 1910); Thomas, *Introduction to the Study of North American Archæology* (Cincinnati, 1898); Moorehead, *Stone Age in America* (Boston, 1910); Obermaier, *Der Mensch der Vorzeit* (München, 1912). The older works of Evans, Baldwin, Short, are still useful. See Archæology, American.

FLINTLOCK. See Small Arms.

FLINT RIVER. One of the principal rivers of Georgia, rising near Atlanta, and flowing in a general southwestern direction to the southwest corner of the State, where it joins the Chattahoochee, forming the Apalachicola (q.v.) (Map: Georgia, B 4). Its length is about 350 miles; it is navigable for small river craft as far as Albany, 150 miles above its junction with the Chattahoochee, and for heavier vessels to Bainbridge, about 50 miles. It drains an area of more than 8000 square miles.

FLINT'SHIRE. A maritime county of North Wales, bounded on the northeast by the Dee, on the east by Cheshire, on the south and west by Denbighshire, and on the north by the Irish Sea (Map: Wales, C 3). Area, 257 square miles, of which one-seventh is arable. The coast, 20 miles long, is low and sandy, but on the Dee estuary fertile. A hill range, parallel to the Dee, runs through the length of the county and rises in Garreg to 825 feet. Another range along the southwest border of the county rises in Moel Famma, 1845 feet. The chief rivers are the Dee, Alyn, and Clwyd. The mining industries are the most important. Coal, and ores of iron, lead, silver, copper, and zinc are the chief mineral products and exports. The chief towns are Flint, the county town; St. Asaph, Holywell, and Hawarden. Pop., 1901, 60,536; 1911, 69,722.

FLIOMA, flĭ-ŏ′mȧ, or **FLIAUM**, flĭ-ōm′. The orange rockfish (q.v.), one of the most abundant and marketable of that group of fishes in California.

FLITCH OF BACON. See Dunmore Flitch of Bacon.

FLITTERMOUSE. See Bat.

FLIX'WEED. See Hedge Mustard.

FLOAT'ING AXLE, in Motor Vehicle. See Motor Vehicle.

FLOATING BATTERY. A vessel with very feeble motive power, or none at all, but heavily gunned, and usually well protected by armor. It is designed to operate in smooth water. See Armor Plate; Ship, Armored.

FLOATING BEAÇONS. See Buoy; Lighthouse.

FLOATING HEART. See Villarsia.

FLOATING ISLAND. A mass of soil and organic matter floating in placid water. Floating islands are formed either by the detachment of portions of the bank in which the network of roots is sufficiently strong to withstand the action of waves, or by aggregations of driftwood in rivers and bays of tropical regions. They may be covered with herbage and trees, and animals taken by surprise while roaming upon them may go on an unexpected journey when the mass starts seaward. They have been found at long distances from land, and it is believed that they may have served to distribute organic forms over insulated regions, such as the islands of the South Pacific. Many lakes in Prussia, France, and England are noted for their floating islands; but the best examples, perhaps, are the great masses of vegetation which collect in the White Nile. These masses, called "sudd" by the Egyptians, must be broken up at regular intervals in order to keep the waters open to navigation.

FLOATING MEADOW GRASS. See Manna Grass.

FLOATING PLANT. See Hydrophyte.

FLOATS (AS. *flota*, Icel. *floti*, OHG. *floz*, Ger. *Floss*, float, raft, from AS. *flēotan*, Icel. *flota*, OHG. *flozzan*, Ger. *flössen*, to float, launch; connected with Lith. *pluditi*, to swim, Lat. *pluere*, to rain, Gk. *πλεῖν*, *plein*, to sail, Skt. *plu*, *pru*, to swim). In agriculture very finely ground mineral phosphate, used as a fertilizer. See Manures and Manuring.

FLOBERGE, flô′bârzh′. The sword of Renaud de Montaubon, in the romance of that name.

FLODDEN FIELD. A plain in Northumberland, England, at the base of Flodden, the northeastern spur of the Cheviot Hills. It is famous as the battlefield where James IV of Scotland was defeated by an English army under the Earl of Surrey, Sept. 9, 1513. Henry VIII of England had declared war against Scotland's ancient ally, France. James IV sent him a peremptory demand to desist and, on Henry's refusal, gathered an army computed at 100,000 men, which however dwindled to 30,000 before crossing the border. James had taken up his position on Flodden Hill, when the Earl of Surrey with 32,000 men, by a skillful movement from the southeast, cut off his communications with Scotland. Observing that the English were strengthening their position, James ordered an advance at four in the afternoon, and a desperate battle ensued. The right wing of the English army, led by Sir Edmund Howard, was defeated by the left wing of the Scottish army, led by the Earls of Huntly and Home, who did not follow up their success. A furious charge of the Scottish right on the English left was repulsed with great slaughter. Meanwhile a desperate resistance was being made by the Scottish centre, where the King fought on foot among his noblemen. Surrounded by outnumbering enemies, they fought bravely until darkness came on, and the King fell pierced by an arrow and mortally wounded in the head. The hill was held during the night by the Scots; but at dawn, seeing the hopeless nature of affairs, they abandoned their position. Their loss amounted to from 8000 to 10,000 men. Besides the King, the Archbishop of St. Andrews and 12 earls were killed, and there was scarcely a notable

Scottish family without a representative among the slain. The English loss amounted to 4000. The sixth canto of Sir Walter Scott's poem "Marmion" gives a fairly accurate description of the action. Consult White, *The Battle of Flodden* (London, 1859).

FLODOARD, flō'dō'är' (894–966). A canon of Rheims, noted for his historical writings. His most important works are *Historia Ecclesiæ Remensis* (to 948), and his *Annales* (919–966). These are of the greatest importance for a knowledge of the history of the tenth century. In addition he wrote a number of other works, some in verse. The best edition of the *Annales* is published by the Picards in their *Collection de textes*, vol. xxxix (Paris, 1905). For other editions, etc., consult: Wattenbach, *Deutschlands Geschichtsquellen*, vol. i (7th ed., Stuttgart, 1904); Molinier, *Les sources de l'histoire de France*, vols. i, v (Paris, 1902, 1904).

FLOE RAT. The ringed seal (*Phoca hispida*), commonly observed in the Arctic-Atlantic regions lying upon the ice floes. See Seal.

FLÖGEL, flẽ'gel, Karl Friedrich (1729–88). A German literary historian. He was born at Jauer, Silesia, studied theology at Halle, and became professor of philosophy at the Ritterakademie at Liegnitz in 1774. His reputation rests upon the work entitled *Geschichte der komischen Litteratur* (4 vols., 1784–87), in which the author, after a general preliminary treatise, reviews the history of satire among the Greeks, Romans, and the various nationalities of modern Europe; the fourth volume being devoted to the comedy, farce, and comic opera. As a continuation of the work, the author published the supplementary productions, *Geschichte des Groteskkomischen* (5th ed., 1888); *Geschichte der Hofnarren* (1789); *Geschichte des Burlesken* (1793).

FLOGGING. The infliction of blows by a rod or scourge, especially when directed by a court or by one who is invested with public authority. In barbarous times scourging in various forms was common to all nations; it was a common practice among European nations down to modern times. With a defective system of detention, flogging appeared to be the most effective method of dealing with petty offenses. In the army and navy of England this method of punishment existed until a comparatively recent date, being finally discontinued under a regulation of 1881; and it is only in late years that it has practically disappeared. In the United States the penalty of flogging has been abolished everywhere except in the State of Delaware, where its employment persists in spite of an active movement for its abolition. Flogging is still generally practiced in Russia as a part of prison discipline. See Punishment; Cat.

FLOOD. See Inundation; Deluge.

FLOOD, Henry (1732–91). A British politician and orator. He was born in Ireland, was educated at Trinity College, Dublin, and at Christ Church, Oxford, and in 1759 entered the Irish House of Commons. Here he soon attracted attention by his eloquence, which, combined with his high social standing, made him a leader of the popular party. He was afterward for some time Privy Councilor for the two kingdoms, and Vice Treasurer for Ireland, but lost the latter office (1781) because of his strong Nationalist sympathies. Disliking Grattan's Irish Bill of Rights on the ground of its not going far enough, Flood quarreled with his former friend. His career in the English House of Commons (1783–90—he was still a member of the Irish House) was not marked by success. He was the author of some poems and of a volume of *Speeches* (1787) that are noteworthy for their good style and logical method. Consult Warden Flood, *Memoirs of Henry Flood* (Dublin, 1838), and Lecky, *Leaders of Public Opinion in Ireland* (2d ed., New York, 1903).

FLOOD PLAIN. A level land area on a river border, formed in times of inundation by depositions of silt, sand, or gravel, which have been eroded and transported from higher land. Owing to frequent additions of new material, the soil of flood plains, or bottom lands as they are popularly called, is fertile and highly productive, but often subject to damage by flood and in northern districts by frost. Notable examples of flood plains are the valleys of the rivers Nile, Mississippi, Ganges, Danube, and Po. See River; Valley.

FLOOR (AS., Icel. *flōr*, Ger. *Flur*, Ir., Gael. *lār*, Corn. *lor*, Welsh *llawr*, Bret. *leur;* ultimately connected with OPruss. *plonis*, barn floor, Lith. *plonas*, flat, Lat. *planus*, level, Gk. πλάξ, *plax*, level surface). 1. In architecture, the horizontal surface which forms the bottom plane of any inclosed building or part of a building, or the top surface of a bridge, terrace, or platform. Hence also, by extension, a story or entire section of a building between two floors or between a floor and roof. In the numbering of floors in this sense, the American usage, unlike the English, generally begins with the ground level, or the floor above the basement or cellar as the first floor, the English numeration beginning with what is commonly called the second floor in America. The term is moreover employed in buildings, by the usage of both countries, to designate not merely the surface or floor proper, but also the entire construction which provides and supports it. The *flooring* is the material which forms this surface; it may be of boards, tiles, stone slabs, concrete, iron, or any other material. In buildings of several stories the floor construction forms at once the floor of the story above it and the ceiling of the story below. In ordinary houses and nonfireproof buildings the *single floor* is used. In this a single system of beams, called *joists*, carries the flooring of boards, which may itself be single or double; the boards, usually tongued and grooved, being nailed directly to the joists. These are usually 2 or 3 inches thick and from 8 to 12 inches deep. In old work, and sometimes still in Europe, the joists are thick, often square in section, which is a much less economical construction, as their strength varies as the square of their depth, but only directly as their thickness. A *double floor* is one in which the joists are carried by girders, and the ceiling below by a second set of lighter joists called ceiling joists. In England the girders are called *binding joists* and the floor joists *bridging joists*. In these floors the girders are set 6 or 8 feet apart, and the bridging joists are therefore light, usually 2 × 6 inches in section. In a *double-framed* floor there are heavy main girders which carry the binding joists upon which in turn rest the bridging joists. When thin deep joists are used, if longer than 8 feet, they are commonly bridged or cross-braced at intervals of 6 feet; this gives greater stiffness and distributes the load upon any given point. When a double flooring of wood is to be laid, the under or rough flooring is often laid diagonally on the joists, and upon this the finished flooring of narrow strips of hard wood, tongued and grooved, is *blind-nailed*, i.e., nailed through the edge of each strip so that the nails are invisible on the finished floor. In "slow-burning" or "mill" construction, there are no joists; heavy beams take their place, spaced 4 to 6 feet apart, and the flooring is of narrow planks 4 inches thick. There is no underceiling, so that the hollow flues for the spread of fire which exist in ordinary floors are wholly avoided.

Fireproof floors are constructed on a great variety of systems, divided into two chief classes—those with metal beams and those constructed wholly of concrete. In the first class the spaces between the beams are filled with flat arches of hollow brick, or with curved arches of solid brick, or with reënforced concrete. Strips or sleepers of wood are buried in cement laid on the top of this construction, to which the wooden flooring is nailed; or the flooring is itself also fireproof, of cement, tiles, mosaic, or *terrazzo* (q.v.), or of some special composition. In floors of the second class, beams of reënforced concrete are spaced from 4 to 8 or 10 feet apart, and the filling is also of reënforced concrete, from 3 or 4 to 8 inches thick. Floors are made waterproof by layers of asphalt or by sheets of lead laid under the finished flooring. In buildings which are vaulted—common in Europe, but rare in America—the back of the vaulting is filled up level with rubble or concrete and the flooring laid upon it as described above.

Floors in monumental buildings have offered in all ages an opportunity for fine decorative effects. In Rome and Pompeii mosaic of small *tesseræ* of marble, porphyry, etc., was used in interesting all-over patterns, and colored marbles, cut into ornamental panels (*opus sectile*), formed the floors of temples and baths. This art was extended by the early Christian and Byzantine artists in their churches, with the addition of *opus Alexandrinum*, a mosaic of small triangles, squares, etc. The mediæval builders paved the floors of chancels and chapels with enameled tiles, and in Italy sometimes with superb inlays of black marble on white (baptistery of Florence; Siena Cathedral). Modern practice has appropriated all these forms of decorative art in the decoration of floors. See Mosaic; Carpentry; Fireproof Construction; Concrete. Consult bibliographies on these articles.

2. In parliamentary law (q.v.), the right or privilege of addressing the chair or the assembly.

FLOORCLOTH. A cloth covering, used as a substitute for or protection of carpets. See Linoleum; Oilcloth; Kamptulicon.

FLOQUET, flō'kā', Charles Thomas (1828–96). A French statesman and journalist, born at Saint-Jean-de-Luz in Basses-Pyrénées. He was educated for the bar at Paris, and while still a student took part in the revolution of 1848. He was not reconciled to the coup d'état of Louis Napoleon and was one of the bitterest opponents of the Second Empire, being one of the accused in the celebrated Trial of the Thirteen. In 1867, on a state visit of the Czar Alexander II to the Palais de Justice, he cried from among the lawyers in their robes, "Long live Poland!" In 1870 he represented the family of the murdered Victor Noir in the case against Pierre Bonaparte. In the organization of the Government of National Defense in 1870 and during the subsequent siege of Paris, Floquet was extraordinarily active and was later chosen as representative to the National Assembly by the Department of the Seine. During the Commune (q.v.) Floquet attempted to mediate between the revolutionary leaders and the Versailles government, but was so radical in his sentiments that he was arrested in 1871 and suffered a month's imprisonment at Paris. In 1872 he appeared in public life as a radical Republican, and in 1876 entered the Chamber of Deputies, voting always with the Extreme Left. Politically he stood with Clémenceau, farther to the Left than either Gambetta or Ferry. The same year he established the Radical journal *Le Peuple*. He was made Prefect of the Seine in 1882, but reëntered the Chamber soon after, and in 1883 took the initiative in demanding the proscription of the princes. From 1885 to 1888, when he became Prime Minister, he was president of the Chamber. The height of his popularity was reached in 1888 after the famous duel in which he wounded General Boulanger (q.v.) in the throat. He was successful in 1889 in his hard political struggle against Boulanger only by abolishing the *scrutin de liste* method of voting which had been Boulanger's main source of power. In February, 1889, on the defeat of his projected constitutional amendment, he resigned the premiership. The Panama disclosures in 1892–93 implicated Floquet and injured his political standing, although he was elected to the Senate in 1894. He died Jan. 18, 1896. Consult: Proth, *Célébrités contemporaines*, vol. ii (Paris, 1883); *Discours et opinions de M. Charles Floquet*, ed. by A. Faivre; Hanotaux, *Histoire de la France contemporaine* (4 vols., Eng. trans., 1903); G. Weill, *Histoire du parti républicain en France* (Paris, 1900).

FLOR, flŏr, Roger di, or Robert Blum (c.1262–1307). A Catalan chief, of German descent. He was born at Brindisi, and as a young boy entered the service of the Templars, and later joined their order. He fought in Palestine, but was accused of robbery at the capture of Acre by the Mohammedans in 1291 and had to escape. He went to Sicily and became vice admiral of King Frederick's fleet; in 1303 a band of free lances chose him their chief, and he led them to Constantinople, where they served Andronicus Palæologus against the Turks. (See Catalan Grand Company.) Roger was made Grand Duke and in Asia Minor warred against the Turks, of whom he is said to have killed 30,000. But he plundered the Greeks and pillaged Philadelphia, which he had rescued from the Turks. The Emperor tried to retain him in his service, but was unable to satisfy his demands for money. Finally, when Roger went to visit Michael, the Emperor's son, he was assassinated. His death aroused his soldiers against the Greeks, and a fierce war followed. Consult Pears, *Destruction of the Greek Empire* (London, 1903).

FLO'RA (Lat., from *flos*, flower). Among the Romans, the name of the goddess of flowers and of the spring, identified by the poets with the Greek Chloris. In Rome she had a temple on the Quirinal and another in the vicinity of the Circus Maximus. The worship of Flora was one of the oldest manifestations of the Roman religious feeling and is affirmed to have been introduced by Numa. She had a *flamen* called the *flamen Floralis*. The *floralia*, or festival in honor of the goddess, first instituted 238 B.C., and made a regular festival in 178 B.C., was celebrated from April 28 to May 3, with much licentious merriment. This festival lasted into the fourth century A.D. On coins Flora is represented with a crown of flowers. Consult Fowler, *The Roman Festivals* (London, 1899), and Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912). See FLOWER.

FLORA. The aggregate of plants growing spontaneously in a country or district, as the flora of Illinois or the flora of a pond. In the latter example the term is ecological and is the equivalent of plant society, but in most cases the term "flora" has no ecological significance. See DISTRIBUTION OF PLANTS; ECOLOGY; TAXONOMY.

FLORA. A city in Clay Co., Ill., 96 miles east of St. Louis, on the Baltimore and Ohio Railroad (Map: Illinois, H 8). It contains a Carnegie library and the Orchard City College. There are manufactories of butter and ice cream, a cannery, apple evaporators, and a railroad roundhouse. The water works and electric-light plant are owned by the municipality. Pop., 1900, 2311; 1910, 2704.

FLORA'LIA. A Roman festival. See FLORA.

FLORÉAL, flō'rā'äl' (from Lat. *floreus*, relating to flowers, from *flos*, flower). The eighth month in the French Republican calendar. It extended from April 20 to May 19 in the years I–VII, and from April 21 to May 20 in the years VIII–XIII. See CALENDAR.

FLORE ET BLANCHEFLEUR, flōr ȧ bläɴsh'flẽr'. The title of an old French romance, so called from the names of the lovers—Flore, a Christian knight, and Blanchefleur, a Saracen slave. The story is used in Boccaccio's *Il Filocopo*, by Chaucer in the Franklin's tale, and appears in a number of English versions.

FLOR'ENCE (It. *Firenze*, Lat. *Florentia*, from *florere*, to bloom, from *flos*, flower). The most important city of central Italy north of Rome, on the Arno, in lat. 43° 46′ N., and long. 11° 15′ E., 60 miles east of Leghorn and 140 miles northwest of Rome (Map: Italy, C 3). Florence, founded later than the neighboring Fiesole, was an important Roman colony; during the later Middle Ages and the Renaissance a free city dominant in Tuscany; from 1569 capital of the Grand Duchy of Tuscany, from 1865 to 1871 of the Kingdom of Italy, and since then of the Province of Florence.

Situation and Topography. From its beautiful situation at the foot of the Apennines, in a valley bordered with gently sloping hills, covered with olive groves, orchards, and vineyards, and crowned with pines, it has derived the title *Firenze la Bella* (Florence the Beautiful). The surrounding country, dotted up to the mountain tops with white villages, pleasant villas, and beautiful suburbs, is the fairest imaginable. The title "Beautiful" is even more richly deserved by reason of its clean streets, well-preserved ancient buildings, and art treasures, representing the most perfect development of the Renaissance. More than any other city, Florence was the cradle of Italian culture. She was the first to produce a native literature, which made her vernacular the written language of Italy; the first to take up the study of the ancient languages, art, and science, and to achieve an artistic development rivaled only by that of Athens. The number of her great men is legion—no city since antiquity can show such a roster; to mention only a few: Dante, Giotto, Masaccio, Donatello, Leonardo, Michelangelo, Galileo, and Alfieri. In Florence, too, perhaps more than in any other Italian city, a glorious past is united with an attractive present.

The Arno divides the city into two unequal parts, the chief of which stands upon the northern bank. Here lay the Roman city, the rectangular shape and straight streets of which may be traced in the heart of mediæval Florence. By the eleventh century new walls were necessary, and in 1285 arose the third and finest circuit, strengthened by 150 towers, "encircling the city like a garland." Although these walls were removed to make room for new driveways, some of the grand old city gates still remain. The Arno is spanned by four ancient stone and two modern iron bridges. Of the former the most interesting is the Ponte Vecchio (1355), which replaced an ancient structure of 1177, affording, with its rows of goldsmiths' shops, an interesting example of the mediæval custom of using bridges for trade. The most beautiful bridge is the Trinità, built in 1567–70, after Ammanati's design.

Squares and Monuments. The general appearance of old Florence is one of republican seriousness and simplicity—the abode of a prosperous and industrious, but warlike merchant and artisan class. The well-paved, cleanly streets are narrow, the houses are high, and the very palaces are fortress-like in character. But all is leavened by an ever-present sense of the fitting and the beautiful. The principal squares, with famous historical or artistic associations, are named after some contiguous church or prominent building.

The Piazza della Signoria, flanked by the grim Palazzo Vecchio, and the beautiful open Loggia dei Lanzi, was the centre of the civic life of Florence. There the great state ceremonies were performed, and the many political experiments of Florence were adjudged by the tribunal of popular revolution. Until 1873 it contained Michelangelo's "David," typical of Florentine liberty, and it still possesses Bandinelli's "Hercules and Cacus," Ammanati's "Fountain of Neptune," and Giovanni Bologna's statue of Cosmo I. The centre of Florentine religious life was the Piazza del Duomo, in which stand the cathedral, the campanile, and the venerable baptistery where every true Florentine was baptized. The Florentines traded in the Mercato Vecchio, now Piazza Vittorio Emmanuele, which contains a statue of the first monarch of that name. Other famous ancient squares are that of the Annunziata, with its arcades and the fountains of Tacca, and the statue of Ferdinand I by Giovanni Bologna; Santa Maria Novella, where public games were celebrated; and Santa Croce, with the monument to Dante.

The new quarters of Florence extend beyond the ancient city walls, the site of which has been converted into fine driveways, the *viali*. The most beautiful of these is the Viale dei Colli, passing over the hills on the southern border and offering fine views of the city. Among the most important modern squares are the Piazza d' Azeglio and the Piazza dell' Indipendenza. The Piazzale di Michelangelo, near San Miniato, with its bronze cast of Michelangelo's "David," affords a marvelous panorama of Florence and the vicinity. The principal public gardens are the Giardino di Boboli, beautifully laid out and containing numerous works of art, and the Cascine, where on Sundays and holidays the *corso* takes place. As regards both heat in summer and cold in winter, the climate

FLORENCE

CATHEDRAL OF SANTA MARIA DEL FIORE (UPPER)

PONTE VECCHIO AND PORTICO OF THE UFFIZI GALLERY (LOWER)

of Florence is extreme and, for Italy, subject to sudden changes.

Churches and Palaces. Although the buildings of old Florence are remarkable as works of architecture, in which some of them, indeed, were epoch-making, they are no less so by reason of their historic associations, and especially for the works of painting and sculpture which they contain. The earliest surviving examples are constructed in a species of Romanesque, more closely related to the antique than this style is elsewhere, and characterized especially by beautiful marble incrustation. The most prominent examples are the exquisite little church of San Miniato and the basilica Santi Apostoli—both probably dating from the eleventh century—and, especially, the baptistery (San Giovanni), probably originated in the seventh century, but in its present form dating principally from the twelfth century. Its three bronze portals, one by Andrea Pisano and two by Ghiberti, one of which is the Paradise portal, mark epochs in the development of Florentine sculpture.

A most remarkable activity in building was evinced in the last decades of the thirteenth century, from which date the principal Gothic buildings of Florence. The oldest of the churches is Santa Maria Novella (1278), the central seat of the Dominicans, constructed by two monks, Fra Sisto and Fra Ristoro. A monument of simple architectural grandeur, it is even more famed for its Gothic paintings by Cimabue, Andrea Orcagna, and the Giotteschi in the Spanish Chapel, and its Renaissance frescoes by Filippo Lippi and Ghirlandaio. Equally celebrated is Santa Croce (q.v.), church of the Franciscans and the Florentine Pantheon. The cathedral, begun probably in 1298, continued throughout the fourteenth century, and completed, excepting the façade, in the fifteenth (consecrated in 1436), owed its construction to the patriotism of the citizens. Among its architects were Arnolfo di Cambio, the original designer, Giotto, Francesco Talenti, Ghiberti, and Brunelleschi. The exterior is celebrated for its marble incrustation, the interior for its wide vaulting and the many works of art it contained, some of which, like the "Singing Galleries" of Donatello and Lucca della Robbia, have been removed. The celebrated cupola belongs to the Renaissance (see below); the façade, though in the Gothic style, is modern, having been begun in 1875 and unveiled in 1888.

The campanile (bell tower), begun in 1334 and built after Giotto's designs, is pure Italian Gothic; light and airy in construction, adorned with reliefs and statues by the most celebrated Florentine sculptors of the fourteenth and fifteenth centuries, this is the most beautiful tower of its kind in the world. Among the civic buildings of the same epoch is the grim and fortresslike Bargello (c.1250), once palace of the podestà. With its mighty bell tower and walls of rough-hewn stone, the Palazzo Vecchio formed a typical seat of the ever warlike and alert government of Florence. The usual ascription of this building to Arnolfo is not certain, and it was not erected in 1298, but in 1300–1301. Nor was Andrea Orcagna the architect of the Loggia dei Lanzi, which was begun in 1374, years after his death, by Simone Talenti. This fine open hall, once used to protect from the weather the participants in the great state ceremonies, which were conducted in the presence of the people, has become the model for such buildings. Half church, half guildhall, the Late Gothic Or San Michele, begun in 1337 by Orcagna, possesses in its tabernacle and in the statues of its niches an epitome of early Florentine sculpture.

The entrance of the Renaissance into Florence is associated with the many works of Brunelleschi. First of all, and his principal constructive work, stands the cupola of the cathedral (1421–34), the first great dome in the history of modern art. Modeled upon that of the Pantheon, which somewhat exceeds it in diameter, though not in height, it is second only to St. Peter's in magnitude. Other important churches are San Lorenzo (1421) and Santo Spirito (1443) and the beautiful little Pazzi Chapel (1420), while in the grim Palazzo Pitti, or Pitti Palace (q.v.), Brunelleschi erected a model of palace construction in rough-hewn stone. A frowning exterior, coupled, however, with light and attractive courtyards, is characteristic of Florentine palaces of the fifteenth century. The most important are Palazzo Riccardi by Michelozzo, once the residence of the Medici; Palazzo Strozzi (1489), perhaps the most beautiful in Florence, by Benedetto da Maiano, and with cornice by Cronaca; and Palazzo Rucellai, by Leonbattista Alberti. The High Renaissance is not so well represented; among the best examples are Raphael's Palazzo Pandolfini (1330) and the new sacristy of San Lorenzo, by Michelangelo.

Educational Institutions. As a principal centre of Italian science and art, Florence has always been the seat of a number of important educational institutions and art collections. The ancient university (1349) is now organized as an Institute of Higher Study; the time-honored school for notaries is now combined with a higher gymnasium. The most important of the art schools, the Accademia delle Belle Arti, possesses a fine collection illustrative of early Florentine painting, and Michelangelo's "David." Chief among the incomparable art collections of Florence are those of the Palazzo Pitti and the Palazzo degli Uffizi. (See PITTI PALACE; UFFIZI PALACE.) The Archæological Museum, rich in Etruscan antiquities, is now housed in the Palazzo Crocetta, and the Museo Nationale, important for early Florentine sculpture, in the Bargello. The Opera del Duomo contains many treasures made for the baptistery and the cathedral, and in the old house of Michelangelo is the Museo Buonarroti, a collection of his works and designs. Among the many and important Florentine libraries are the Laurentian, begun in 1444 by Cosmo de' Medici and incomparably rich in classic manuscripts; the National Library (which receives a copy of every book printed in Italy), composed principally of the Biblioteca Magliabecchiana, founded by Magliabecchi in 1747, and possessing about half a million volumes, besides pamphlets, letters, prints, etc.; the Marucelliana (1713), with a fine collection of prints; and the Ricciardana. The Florentine archives (Archivio Centrale) are universally rich and well organized.

Industries, etc. The great wool and silk industries, which formed the economic basis of the past greatness of Florence, have long since decayed; at present the manufacture of art objects is the most important. Especially celebrated are modern Florentine mosaics of colored marbles, the finest of which are made in the royal factory, founded in 1574, and there are numerous establishments for sculpture in marble, alabaster, and serpentine, for wood carving, and for the manufacture of stained glass. There are also silk and hat manufactories, jewelry works, porcelain potteries, and glass factories. The water supply, derived from reservoirs 7 miles north of Florence, is supplemented by a modern hydraulic system which draws the water from the river. There are an American consul and vice consul. The population in 1901 was about 165,000, the population of the commune being 205,589; communal population in 1911, 232,860. The increase in population is chiefly due to immigration, the birth rate in recent years having frequently fallen below the death rate. The city is growing in every direction, and the new quarters show better sanitary methods than those of earlier years, but in most cases an absence of the artistic qualities which characterize those of the older sections of the city.

History. Originally a market place situated at the base of the high hill crowned by the ancient Etruscan city Fæsulæ (Fiesole, q.v.), Florence was probably founded about 187 B.C., in connection, it has been thought, with the building of a road from Bononia (Bologna, q.v.) to Arretium (Arezzo, q.v.), later part of the Cassian Way (q.v.). Its importance begins with the establishment of a Roman military colony in its precincts, decreed by Sulla, but carried out by Augustus. (For another evidence of its importance at this time, see CHIANA.) Under the Emperor Hadrian the Cassian Way was extended through Florence, greatly increasing the town's importance. Tombs found under the pavement of the Vicolo del Campidoglio show that back of the Roman city was a settlement of the villanova (q.v.) period. Remains, too, of the Roman *capitolium*, of baths, two theatres, and an amphitheatre have been found. (Consult Davidsohn, *Geschichte von Florenz*, vol. i, Berlin, 1896; id., *Forschungen zur älteren Geschichte von Florenz*, vol. i, ib., 1896). In the fourth century A.D. it became the seat of a Christian bishop and was the capital of the Province of Tuscia-Umbria. In 401 Radagaisus, at the head of an innumerable horde of barbarians, besieged the city, but was defeated, and his army was destroyed by Stilicho, general of the Emperor Honorius. In 542 Totila, the Gothic King of Italy, besieged Florence, but did not capture it. Under the Lombards Florence was the capital of a dukedom. Although Charles the Great may have greatly benefited the city, the former belief that it lay desolate until in 799 he ordered its walls and public buildings rebuilt is untenable.

In 1115 Florence, with a part of Tuscany, was bequeathed to the popes by the Countess Matilda, who had inherited the civic jurisdiction from her mother, the Countess Beatrix. During her rule the people of the city had obtained some power, and the *boni homines* or *sapientes* presided over the courts when Matilda was not present. The city was already at that time noted for its wealth.

It received an influx of population from the inhabitants of Fiesole, when their hill town was destroyed in 1125. During the bitter wars between Pope and Empire, Florence and Tuscany for a time stood aloof from the civil feud which raged throughout Italy; but in 1215 Florence became involved in the great party struggle, and for 33 years the city was distracted by the deeds of bloodshed and violence of two rival factions, who assumed the names and adopted the respective causes of Guelph and Ghibelline. (See GUELPHS AND GHIBELLINES.) After 1115 the government of the city had been in the hands of a comparatively few families, presided over by 12 consuls assisted by 100 *boni homines* chosen by the greater guilds. In 1250 the citizens rebelled against the nobles and overthrew their authority. Twelve magistrates, or *anziani*, were chosen annually in place of the consuls. Two other magistrates, strangers by birth, were elected—one, the *podestà*, was invested with supreme authority in civil and criminal cases; the other, with the title of the captain of the people, had the chief command of the militia, in which were enrolled all the youth of the state, who were bound at the call of this magistrate and the "sound of the bells," the historic Florentine tocsin, to join their countrymen fully equipped for fight; 20 companies defended the town, 96 the country. After the death of the Emperor Frederick II, the great protector of the Ghibellines, the Guelph, or papal, party gradually rose in power in Florence, and during 10 years of grandeur and prosperity under their ægis the city stood not only the first in Tuscany, but one of the first of all Italy. In 1254 the Florentines first coined their golden florin, which commemorated a period of great success in the annals of Florence, whose forces had humbled Siena, Arezzo, Pisa, and Pistoia, in 1252, and in 1254 captured Volterra. In 1260 the standard of civil war was again raised by the Ghibellines of Florence, who, in league with Manfred of Naples, attacked the Guelphs and cut their forces to pieces in the sanguinary battle of Montaperti. The conquerors entered Florence in the name of Manfred, abolished the popular institutions, established an exclusively aristocratic executive, and even strongly advocated the entire destruction of the city as the hotbed of Guelphism. This barbarous scheme was strenuously and successfully resisted by their leader, Farinata degli Uberti, immortalized by Dante. Pope Urban IV, French by birth, summoned against Manfred a French army, led by Charles of Anjou (brother of King Louis IX), to whom he offered the Kingdom of the Two Sicilies. Manfred was defeated and slain in the battle of Benevento, and Guelph ascendancy was restored throughout Italy and in Florence.

In 1266 Charles fully restored to the Florentine people their internal institutions and received their offered allegiance for 10 years. In 1282 the *priori*, a new executive and commercial power, consisting of the presidents of the greater arts or guilds, were established in Florence; in 1293, by the consent of the *priori*, a higher chief was elected, with the title of *gonfaloniere*. In 1300 Dante was one of the *priori*, when the civil feud assumed a new form in the strife between the two factions into which the Guelph party had split, the Neri (blacks) and the Bianchi (whites), the latter of whom soon became identified with the Ghibelline cause. Their dissensions were interrupted by the appearance of Charles of Valois, invited by Boniface VIII to restore tranquillity, in 1301. Charles espoused the part of the Guelphs, or Neri, and sanctioned every outrage on the Bianchi, who were plundered and barbarously murdered, the survivors being exiled and beggared. Among these were Dante and the father of Petrarch. In 1306 Pistoia was besieged and taken by famine with great barbarity. In 1315 the Florentines met with a severe check from the Ghibellines of Pisa, and between 1320 and 1323 were repeatedly defeated by Castruccio Castracani, Chief of the Republic of Lucca. Weakened by long dissensions, and alarmed by Castruccio's threat of marching on the city, the citizens appealed to the King of Naples for aid. They received joyfully an officer of the King, entitled the Duke of Athens, sent as royal vicar, whom they proclaimed dictator of the Republic. His intrigues to overturn the Republic caused a general popular rising and his expulsion in 1343. After an aristocratic régime of the wealthier merchant guilds there came, in 1378, a revolution of the wool combers for the benefit of the lowest classes. Under the leadership of Michele di Lando they dominated the city three years, imparting certain permanent democratic tendencies.

The chief power of Florence was then alternately wielded by the democratic families of the Alberti and the Ricci, and by their patrician rivals, the Albizzi, who for the space of 53 years guided the Republic in the path of independence and progress. In 1406 the Republic of Pisa fell under the sway of Florence, after a most heroic resistance. From 1434 the history of Florence is intimately connected with the house of Medici, whose influence supplanted that of the Albizzi. (See MEDICI.) Under Lorenzo de' Medici (1449–92), styled *Il Magnifico*, Florence was the great centre of the Renaissance movement which revived the arts and elegances of antiquity. The prophetic fulminations of the Dominican friar Girolamo Savonarola (q.v.), whose influence lived long after he was martyred at the stake in 1498, resulted in the expulsion of the Medici from Florence in consequence of their licentious lives, extravagance, and their aiming at sovereign power. They were restored in 1512 and again expelled in 1527. To their intrigues Florence owed her final loss of republican rights and institutions. Pope Clement VII, of the house of Medici, formed a league with the Emperor Charles V, by which the liberties of Florence were to be extinguished and the sovereign power invested in the son of Giuliano de' Medici, Alessandro de' Medici, who had married the Emperor's natural daughter. In September, 1529, an army of Imperialists under Emperor Charles V entered Tuscany; on Aug. 9, 1530, the siege of Florence terminated after a defense marked by devotion and bravery on the part of the citizens, in which Michelangelo as the Republic's engineer, greatly distinguished himself. Ducal government was established in 1532, and in 1569 the Florentine dominions were erected into the Grand Duchy of Tuscany. In 1859 Tuscany was annexed to the Kingdom of Sardinia, and in 1865 Florence replaced Turin as the capital of the new Kingdom of Italy. In 1871, however, the capital was removed to Rome.

Bibliography. For description, see Taine, *Voyage en Italie* (Paris, 1866; Eng. trans., New York, 1897); Yriarte, *Florence* (Paris, 1881; Eng. trans., London, 1882); Munz, *Florence et la Toscane* (Paris, 1897). Consult also: Ruskin, *Mornings in Florence* (Orpington, 1889); Hare, *Florence* (ib., 1884); Hutton, *Literary Landmarks of Florence* (New York, 1897); Grifi, *Saunterings in Florence* (3d ed., Florence, 1904); Lucas, *A Wanderer in Florence* (New York, 1912); Ryan, *Florence in Poetry, History, and Art* (Chicago, 1913). For buildings of old Florence, see Frey, *La Loggia dei Lanzi* (Berlin, 1885). Florentine historians are Matteo Villani, *Croniche* (latest ed., Triest, 1857–58); Dino Compagni (Eng. trans., London, 1906); Varchi, Nardi, Jacopo Pitti, and especially Machiavelli, *Istorie fiorentine* (Florence, 1532; Eng. trans., London, 1891). Modern contributions are Villari, *I primi due secoli della storia di Firenze* (Florence, 1891; Eng. trans., London, 1894); Guicciardini, *Storia fiorentina* (Florence, 1859); Scheffer-Boichorst, *Florentiner Studien* (Leipzig, 1874); Capponi, *Storia della repubblica di Firenze* (3 vols., Florence, 1888); Perrens, *Histoire de Florence* (9 vols., Paris, 1877–1900); Doren, *Studien aus der florentiner Wirtschaftsgeschichte* (2 vols., Stuttgart, 1901–08); Reumont, *Geschichte Toskanas* (3 vols., Gotha, 1876–77); Anzilotti, *La crisi costituzionale della Repubblica Fiorentina* (Florence, 1912); Heyck, *Florenz und die Mediciäer* (Bielefeld, 1902); Hyett, *Florence: Her History and Art* (New York, 1903); Philippi, *Florence* (ib., 1905); Staley, *The Guilds of Florence* (2d ed., London, 1906). For the art of Florence, see RENAISSANCE ART; SCULPTURE; PAINTING; FLORENTINE SCHOOL OF PAINTING.

FLORENCE. A city and the county seat of Lauderdale Co., Ala., 126 miles by rail south-southwest of Nashville, Tenn., on the Tennessee River, at the foot of the Muscle Shoals Canal, and on the Louisville and Nashville and the Southern railroads (Map: Alabama, B 1). It is finely situated on a plateau 200 feet above the river and is the seat of a State normal college, and of a normal school for negroes, founded in 1903. Other features are the steel railroad and passenger bridge across the Tennessee, and Wildwood Park, of 250 acres. An old military road, cut out by General Jackson from New Orleans to Nashville, passes through the city. The manufactures include wagons, wooden pumps, stoves, boilers, engines, pig iron, cotton-seed oil, fertilizers, staves, cotton yarns and cloth. Lumbering and mining are carried on. Plans are under way for developing the power of the Muscle Shoals, which have a potential capacity of some 450,000 h. p. Florence was laid out in 1819, received a city charter in 1889, and adopted the commission form of government in 1914. Pop., 1900, 6478; 1910, 6689; 1920, 10,529.

FLORENCE. A city and health resort in Fremont Co., Colo., 32 miles by rail west by north of Pueblo, on the Atchison, Topeka, and Santa Fe, the Denver and Rio Grande, and the Florence and Cripple Creek railroads, and on the Arkansas River (Map: Colorado, D 3). There are petroleum-oil wells and coal mines in the vicinity, and the city has oil refineries, ore mills, and gold-reduction works. It is also engaged in truck gardening. The city owns its water works. Pop., 1900, 3728; 1910, 2712.

FLORENCE. A city and the county seat of Florence Co., S. C., 102 miles north by east of Charleston, on the Atlantic Coast Line and the South Carolina Western systems (Map: South Carolina, E 2). It is in a fertile agricultural region, carries on an extensive trade in cotton and tobacco, and has tobacco warehouses, stemmeries, and drying plants, cottonseed-oil mills, machine shops, railroad repair shops, lumber mills, etc. The city contains the South Carolina Industrial School, a State agricultural experiment station, a fine Federal building, a national cemetery, and an old Confederate prison stockade. Florence adopted the commission form of government in 1913. It owns its water works and sewage system. Pop., 1900, 4647; 1910, 7057; 1920, 10,968.

FLORENCE, Council of. See Ferrara-Florence, Council of.

FLORENCE, William Jermyn (1831-91). A popular American comedian, born at Albany, N. Y., his original name being Bernard Conlin. After some experience as an amateur and in minor parts at various theatres, his real work as an actor began at Brougham's Lyceum, New York, 1850, where in 1851 he made a hit in the part of a fireman. In 1853 he married Mrs. Malvina Pray Littell, with whom he won great applause in *The Irish Boy and Yankee Girl*, repeated in London three years later. Among his most successful characters were also Bardwell Slote in *The Mighty Dollar*, Bob Brierley in *The Ticket-of-Leave Man*, and Sir Lucius O'Trigger in *The Rivals*. This last he played to the Bob Acres of Joseph Jefferson, with whom he appeared in a number of pieces from 1889 till his death, which occurred in Philadelphia. Consult: McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896); Matthews and Hutton, *Actors and Actresses of Great Britain and the United States* (ib., 1886); Winter, *The Wallet of Time* (2 vols., ib., 1913).

FLORENCE CRITTENTON MISSION, National. An organization established in 1883 by Charles F. Crittenton (q.v.). Its general object is to assist all women who are in trouble. Especial attention is paid to cases of young girls who have gone astray; these are provided with shelter and cared for. Employment is secured for them and they are encouraged to return to a normal life. The association supports homes in seven cities in the United States, one in Tokyo, Japan, and one in Marseilles, France. The headquarters of the national mission are in Washington, D. C. The largest work of the mission is carried on at the Florence Crittenton home in New York City. Here there have been assisted nearly 900 girls. The work of the mission in New York City is closely connected with the night courts and other municipal courts. There are summer homes at Ossining, New York, and Ocean Grove, New Jersey, and here girls are given a chance for vacation and fresh air.

FLORENCE OF WORCESTER, wu̮s'tẽr (?-1118). An English chronicler and monk, who lived at Worcester. His *Chronicon ex Chronicis* drew material largely from the work of Marianus, an Irish monk, who had written a general chronicle, containing facts on the history of Britain and Ireland; it is a valuable authority on early English history. As continued up to 1141 by John of Worcester, Florence's work was edited by Thorpe (1848-49) and translated by Stevenson in vol. ii of *Church Historians of England* (1853) and by Forester in Bohn's *Antiquarian Library* (1854).

FLORENT, flō'räɴ', François. A French jurist of the seventeenth century. He was born at Arnay-le-Duc and was professor of canonical law at Orléans and Paris. His works have been published by Doujat (1679; reprinted, 1763).

FLORENTIA. See Florence (Italy).

FLOR'ENTINE SCHOOL OF PAINTING. The most important Italian school during the fourteenth and fifteenth centuries. It was eminent in individuality and intellectual qualities, its members often being sculptors and scientists as well as painters. Their works are excellent in line and composition and are well modeled, showing the influence of Florentine sculpture, but are not so rich in color as the Venetian. Florentine art is the most decorative of all Italian painting, being mostly fresco work. The Florentine school attained its high position through Giotto (c.1266-1337), and throughout the fourteenth century it remained dominant in Italy. The painting of the Renaissance originated in Florence, in the works of Masolino and Masaccio, spreading thence throughout Italy. During the fifteenth century the Florentine was the first school of Italy and the world. Among the many artists which it produced at this period the most important, besides those mentioned, are Fra Angelico, Filippo and Filippino Lippi, Botticelli, Domenico Ghirlandaio, and Andrea del Verrocchio. Florentine art was characterized at this time by a vigorous naturalism, which was replaced during the sixteenth century by a growing imitation of the antique. Florence produced two of the greatest masters of the High Renaissance, Leonardo da Vinci and Michelangelo, to say nothing of others like Fra Bartolommeo and Andrea del Sarto, and the influence of its masters was determinative in forming Raphael's art. But its chief artists migrated to other cities, forming the Lombard and Roman schools, and during the sixteenth century Florence lost the primacy.

Consult authorities on Italian painting under Painting, e.g., Crowe and Cavalcaselle, *History of Painting in Italy* (ed. Douglas, London, 1903-11); Berenson, *Florentine Painters of the Renaissance* (New York, 1904); Cartwright, *The Painters of Florence* (ib., 1901). See also Renaissance Art.

FLORES, flō'rĕs. A mountainous island in the Azores, the most westerly of the group. Area, 57 square miles. The products are cattle and poultry. Near the island in 1591 took place the fight between the British warship *Revenge* and several Spanish warships. Pop., 1900, 8141. Chief town, Santa Cruz.

FLORES, flō'rĕs. An inland department of Uruguay. Area, 1744 square miles. Pop., 1912, 20,181. The surface is rolling and well watered. Cattle raising is the principal industry. Considerable wheat and corn are produced. Capital, Trinidad.

FLORES, flō'rĕs. An island of the Malay Archipelago, lying halfway between Java and Timor, between lat. 8° and 9° S. and long. 120° and 123° E. (Map: East Indies, F 7). It measures 224 miles in length by an average breadth of 35, with an area of about 5859 square miles. Its surface is mountainous, rising in parts to 8000 feet, and covered with forests. Several volcanoes are intermittent; Gunong Api is in continual activity. The soil is fertile. There is a scanty export to Celebes of sandalwood and birds' nests. Rubber culture has been attempted and has met with considerable success. Pop. (est.), 250,000. The government is administered by native chiefs, but the island is a dependency of the Dutch residency of Timor, the claim of Portugal having been vacated in 1859.

FLORES, flō'rĕs, Juan José (1800-64). A Spanish-American soldier, and the first President of the Republic of Ecuador, born at Puerto Cabello, Venezuela. He fought under Bolívar in the War of Independence and in 1828 became commander in chief in the campaign against

Peru. When in 1830 Ecuador became independent and framed a constitution, he was elected President. Succeeded by Rocafuerte in 1835, he continued to be commander in chief of the army. In 1839 and 1843 he was reëlected to the presidency, which in 1845 he resigned in consequence of a military revolution instigated by the Liberals, and voluntarily expatriated himself to Europe. He remained 15 years away from Ecuador. In 1863, at the call of the Ecuadorians, he again drew his sword in their defense and saved them from losing their liberty under the attacks of General Franco.

FLORES, Venancio (1809–68). A Spanish-American marauding adventurer and soldier and a president of Uruguay, born in Paysandú. In 1853 he was leader of the so-called "Colorados," or advanced party, in the revolt (started under circumstances that were peculiarly traitorous and repellent) against the government and was himself elected president. A counter-revolt having arisen in 1855, he withdrew to the Argentine Confederation, whose military service he entered. Aided by President Mitre of the Confederation and by Brazil, in 1865 he entered Montevideo in triumph and became Provisional Governor of the Republic of Uruguay. In 1866 he was elected President. He joined Brazil and Argentina in the triple alliance against Paraguay and for a time commanded the allied forces. The Emperor of Brazil had conferred upon him the rank of Prince, on the occasion of decorating him with the grand cross of the Order of the Cruzéiro. On Feb. 15, 1868, he resigned the presidency and four days afterward was assassinated during disturbances incident to a recurrence of revolution.

FLORES'CO, or **FLORESCU,** Joan Emanuel (1819–93). A Rumanian soldier and politician. He was born at Rimnik, studied at Bucharest, and at the Ecole d'Etat-Major of Paris, and during the Crimean War served as a colonel in the Russian army. Previous to 1877 he was several times Minister of War and effected many reforms in the military establishment of Rumania. In 1890 he became President of the Senate, and in March–December, 1891, he was President of a Conservative ministry. His policy was strongly influenced by friendship for Russia.

FLORESIS HUMMER. See Humming Bird.

FLOREZ, flŏ'râth, Henrique (1701–73). A Spanish theologian, archæologist, and historian, born at Valladolid. He wrote many works on the history and archæology of his country, among which are: *Llave historial* (1743); *La España sagrada—teatro geográfico histórico de la iglesia de España,* his most important work (51 vols., Madrid, 1747–73); *España carpetana, medallas de sus colonias, municipios y pueblos antiguos de España* (3 vols., ib., 1757–75), completed by Risco Fernández and others; *Memorias de las reinas católicas* (2 vols., ib., 1761).

FLOREZ (flŏ'râth) **ESTRADA,** Alvaro (1769–1853). A Spanish political economist. He was born at Pola de Somiedo, Asturias, of which province he became procurator general in 1808. He took the initiative in the uprising against Napoleon I, and as an ardent patriot again defended the rights of the nation as against King Ferdinand VII in his *Representación á Fernando VII,* which created a great stir and was frequently reprinted and translated. His *Curso de economía política* (6th ed. in 2 vols., 1843) was first published in France during his exile (1828); and a French translation appeared in 3 vols. (Paris, 1833).

FLORIAN, flô'rê-äN', Jean Pierre Claris de (1755–94). A French poet and romancer. He was born near Anduze, Languedoc, of noble and partly Spanish blood, and was related to Voltaire, who patronized his youth, as other powerful men of culture did his maturity. He served for a time in the army, but soon resigned to devote himself to literature. He was imprisoned at the outbreak of the French Revolution and did not long survive the effects of his incarceration. He first attracted attention in 1782 by versified epistles and eclogues, imitated Cervantes and Gessner in his *Galatée* (1783) and Fénelon and Marmontel in *Numa Pompilius* (1786), an educational work of wide popularity. This opened to him the Academy (1788), and in that year he published his once famous pastoral *Estelle.* The *Gonzalve de Cordoue* (1791) and his collection of *Fables,* in the manner of Lafontaine, now considered the best part of his works and still recited in French primary schools, completed his literary contributions, though he left unfinished a *Guillaume Tell* and an abridgment of *Don Quixote.* He died in Paris, Sept. 13, 1794. All his works (20 vols., Paris, 1824) are delicately sentimental, turning to idyllic artificiality the nature cult of Rousseau. Consult: Montvaillant, *Florian, sa vie, ses œuvres, sa correspondance* (Paris, 1879); Claretie, "Florian," in the *Classiques populaires* (Paris, 1888); W. Schwenke, *Florians Beziehungen zur deutschen Litteratur* (Leipzig, 1909).

FLO'RIAN (Lat. *Florianus*), Saint (?–c.303). The patron saint of Upper Austria. It is said that he was born in what is now Austria, served in the Roman army, and was thrown into the Enns, weighted with a stone, and drowned during the Diocletian persecution, about 303. He was buried on the site of the Augustinian monastery of St. Florian, 8 miles southeast of Linz. An untrustworthy tradition says that the remains were afterward taken to Rome and in 1183 were transferred to Cracow. He is often represented as pouring flames from a vessel, and is invoked for protection against fire. His day is May 4.

FLORIANOPOLIS (formerly Desterro, Nossa Senhora do Desterro, or Santa Catharina). The capital of the State of Santa Catharina, Brazil, situated on the west coast of the island of the same name, 485 miles southwest of Rio de Janeiro (Map: South America, S., K 3). It has a picturesque site, being surrounded by hills, is regularly built, and contains a fine plaza, around which centre the principal buildings and a lyceum, an arsenal, and a hospital. An excellent harbor defended by fortifications has contributed to the city's commercial development, its principal exports being manioc flour, rice, coffee, sugar, fish, hides, earthenware, and artificial flowers. Pop., 1890, 30,687. Desterro was founded in 1640 by colonists from the Azores.

FLO'RIAN'S. The best-known café of Venice, on the Piazza San Marco. It has been a resort for Venetians and travelers for two centuries.

FLO'RICAN, or **FLO'RIKIN.** A genus of large game birds, nearly allied to the bustards, two species of which inhabit the open districts of India—the larger, or Bengal, florican (*Sypheotis bengalensis*), and the lesser (*Sypheotis* *aurita*). They go about in small flocks, extremely shy, wary, and strong of flight, and in the winter offer excellent sport to the gunner and are highly prized as delicate food. Both species are mainly black, with crests and ear tufts, and with white markings on the wings; but the females and young of the Bengal species are mottled brown and white. Consult Baker, *Journal Bombay Natural History Society*, xxi (Bombay, 1912).

FLO′RICULTURE (from Lat. *flos*, flower + *cultura*, cultivation, from *colere*, to cultivate). The cultivation of plants for æsthetic purposes. In its widest sense floriculture embraces the growing of plants in windows, as well as in greenhouses and gardens, and some of its phases are closely linked on the one hand with arboriculture and on the other with landscape gardening (qq.v.). In floriculture plants are grown for their individual effect, in landscape gardening for their effect in the landscape picture. From early times flower growing has been practiced in all civilized countries; but its development as a business of commercial importance, especially in America, is of comparatively recent date. Commercial floriculture in the United States is scarcely a century old; but its progress has been steady and during the last half of the nineteenth century was very rapid. In 1852 there was scarcely any capital invested in greenhouses and gardens, except for the pleasure of the owners; in 1909 there were 7444 commercial florists' establishments having an average of over 15,400 square feet of glass each, or a total of 114,655,000 square feet. The average yield value of these establishments was 30 cents per square foot, or a total of about $34,400,000. The florist secures his greatest income from the production of cut flowers. Roses, carnations, chrysanthemums, violets, and lilies, in the order named, are the mainstay of this trade, although several million dollars' worth of miscellaneous flowers and plants in season are also grown. See articles on flowers mentioned above. Consult: Henderson, *Practical Floriculture* (New York, 1911); Hunt, *How to Grow Cut Flowers* (Terre Haute, 1893); Taft, *Greenhouse Management* (New York, 1898); Scott, *Florists' Manual* (Chicago, 1899); Bailey, *Standard Cyclopedia of Horticulture* (New York, 1914); Waterfield, *Flower Grouping in English, Scotch, and Irish Gardens* (ib., 1907); Wright, *Beautiful Flowers and How to Grow Them* (2 vols., ib., 1910).

FLOR′IDA (Sp., flowery, so called by Ponce de Léon, either from his discovery of it on Easter Sunday, Sp. *Pascua florida*, *Pascua de flores*, flower Easter, or, less probably, on account of the abundance of flowers which he saw). Known both as the "Everglade State" and as the "Peninsula State." The southernmost State of the American Union, situated between lat. 24° 30′ and 31° N. and long. 79° 48′ and 87° 38′ W. It is bounded on the north by Alabama and Georgia, on the east by the Atlantic Ocean, on the south by the Strait of Florida and the Gulf of Mexico, and on the west by the Gulf of Mexico and Alabama, the extreme westward boundary being defined by the Perdido River. The greatest length from north to south is about 450 miles, and the extreme width of the northern or continental portion is nearly 400 miles. The peninsular extension has a length of 375 miles, with an average width of 95 miles. Florida ranks second in size among the States east of the Mississippi River; its total area is 58,666 square miles, of which 3805 square miles are occupied by lakes, rivers, and ponds. The capital is Tallahassee.

Geology. As Florida is wholly included in the coastal plain (which borders the Atlantic and Gulf coasts from Long Island to Mexico), its geological formations are all comparatively recent. It was once believed that the whole State was composed of alluvium. Louis Agassiz in 1852 advanced the theory that the peninsula was of coral origin; and this view, somewhat modified by Joseph Le Conte in 1857, was pretty generally accepted until 1881, when Eugene A. Smith demonstrated the Tertiary age of a large part of the peninsula.

No igneous or greatly metamorphosed rocks occur in or near Florida. The strata are all sedimentary and lie horizontally, as deposited, or with a gentle dip, distortions such as characterize mountainous regions being conspicuous by their absence. The foundation rock throughout the State is a massive limestone, and the deposits overlying it consist of limestones, sandstones, clays, and sands, derived mostly from sediments carried down from the higher land to the north and west.

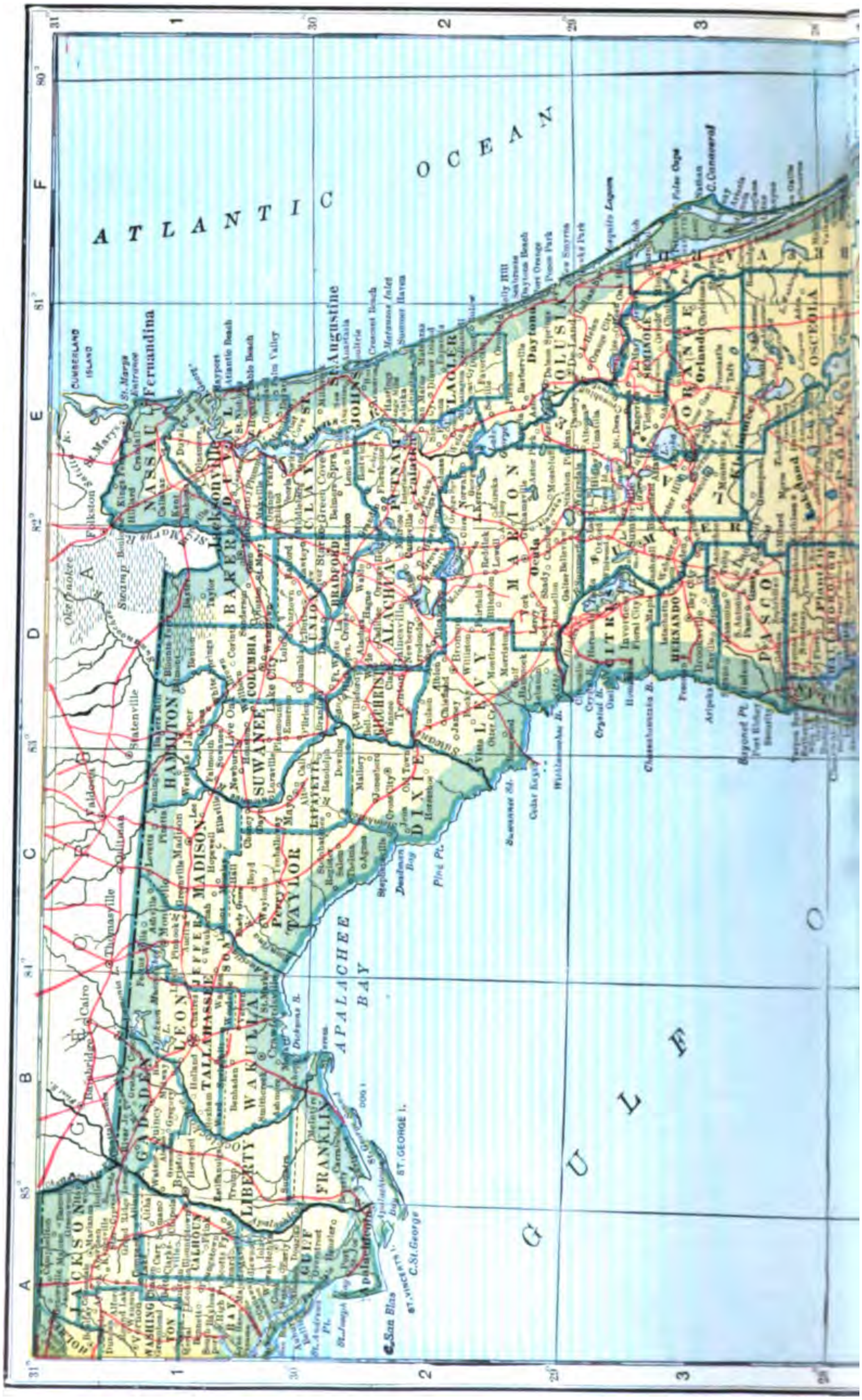
All the formations belong to the Cenozoic, the latest of the large divisions of geological time. They may be classified as follows, in descending order:

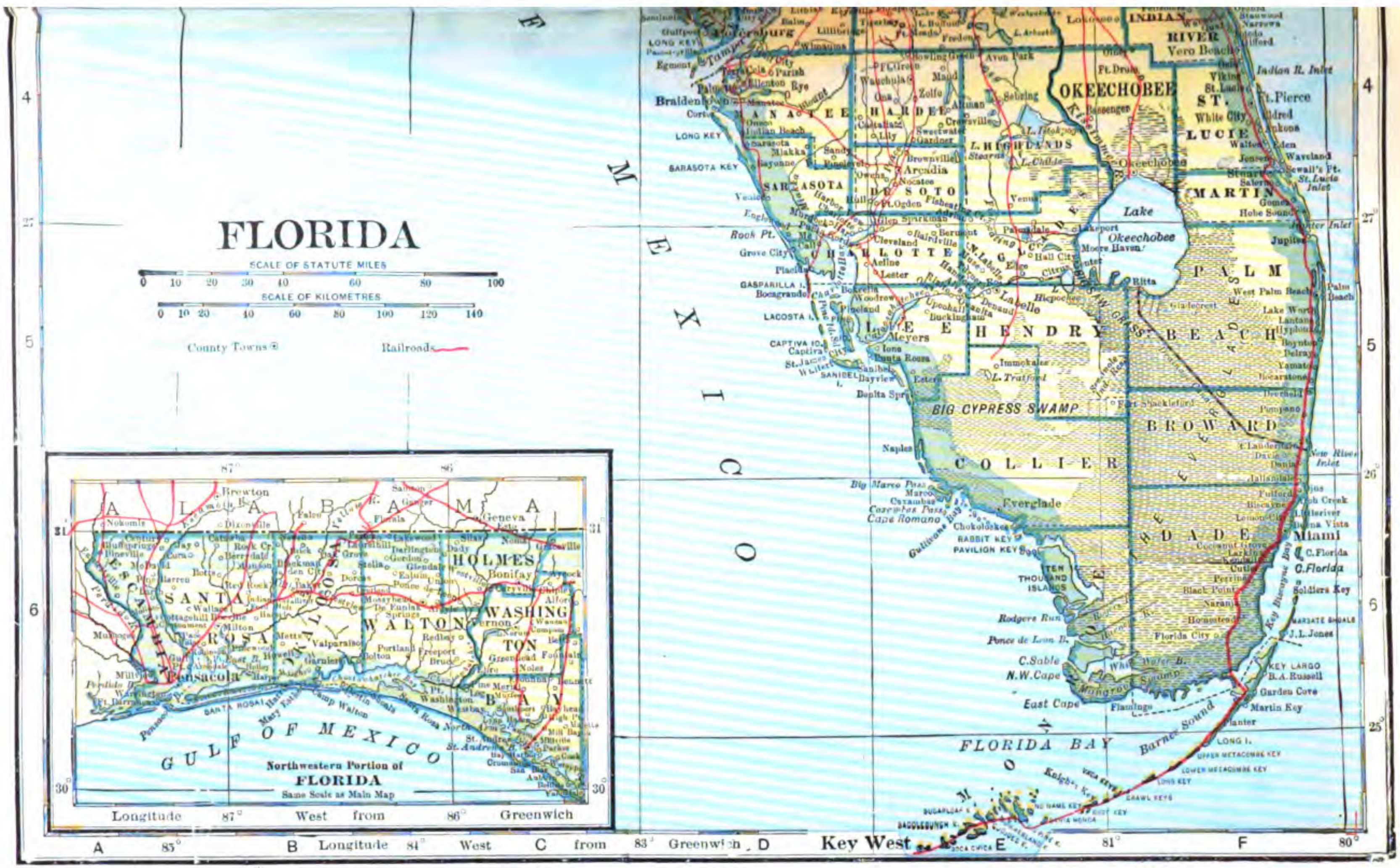
RECENT: Sand dunes, shell mounds, Indian remains, soils, etc.
PLEISTOCENE: Miami and Key West oölitic limestones; Key Largo coralline limestone; coquina and other shell deposits.
PLIOCENE: Caloosahatchee and Nashua marls; hard rock and land pebble phosphate deposits.
MIOCENE: Jacksonville limestone; Choctawhatchee marl.
OLIGOCENE: Alum Bluff, Chattahoochee, and Vicksburg formations.

The oldest formation certainly known in Florida, the Vicksburg limestone, belongs, as indicated in the table, to the Oligocene period, and was formerly classed as Eocene. It is several hundred feet thick and made up largely of the minute shells of foraminifera, although many larger shells and other fossils occur in it. The Chattahoochee and Alum Bluff formations, which immediately overlie the Vicksburg, are at or near the surface over much of the northwestern part of the State and are exposed along the Hillsborough and Manatee rivers in the southern part.

The Miocene formations are exposed at Alum Bluff on the Apalachicola River and evidently underlie a considerable area in that part of the State. They are found also near the east coast from Jacksonville southward. Marine shell marls of Pliocene age occur over much of the southern half of the peninsula and are best exposed along the Caloosahatchee River. Pleistocene deposits are well developed in the extreme south. The Miami oölite, which appears to underlie a considerable part of the Everglades (q.v.), is perhaps the most extensive of this group. The only strictly coralline formation is the Key Largo limestone, which forms the "upper" Keys, from Soldier Key to Bahia Honda.

Underground Waters. The chief sources of water supply in Florida are shallow or surface wells, deep or artesian wells, and springs. The shallow wells usually penetrate only the superficial sands and clays and furnish soft water. The deep wells penetrate the various formations previously named and furnish water free


ATLANTIC OCEAN
GULF OF
APALACHEE BAY
GEORGIA
Okefenokee Swamp
Fernandina
St. Augustine
Daytona
Orlando
Ocala
Tallahassee
Apalachicola
Thomasville
Valdosta
JACKSON
GADSDEN
LEON
JEFFERSON
MADISON
HAMILTON
SUWANEE
COLUMBIA
BAKER
NASSAU
DUVAL
CLAY
ST. JOHNS
PUTNAM
FLAGLER
VOLUSIA
ORANGE
OSCEOLA
SEMINOLE
LAKE
SUMTER
MARION
ALACHUA
BRADFORD
UNION
LEVY
CITRUS
HERNANDO
PASCO
LAFAYETTE
TAYLOR
DIXIE
WAKULLA
LIBERTY
FRANKLIN
GULF
CALHOUN
BAY
WASHINGTON
HOLMES
C. Canaveral
C. St. George
C. San Blas
St. George I.
Cumberland Island
Cedar Keys
Pine Pt.
Deadman Bay
A
B
C
D
E
F
1
2
3
31°
30°
29°
28°
80°
81°
82°
83°
84°
85°


FLORIDA
SCALE OF STATUTE MILES
0 10 20 30 40 60 80 100
SCALE OF KILOMETRES
0 10 20 40 60 80 100 120 140
County Towns ⊕
Railroads
G U L F O F M E X I C O
FLORIDA BAY
INDIAN RIVER
OKEECHOBEE
ST. LUCIE
MARTIN
PALM BEACH
BROWARD
DADE
MANATEE
HARDEE
HIGHLANDS
SARASOTA
DE SOTO
CHARLOTTE
GLADES
LEE
HENDRY
COLLIER
MONROE
Lake Okeechobee
BIG CYPRESS SWAMP
Everglade
Miami
Key West
Northwestern Portion of FLORIDA
Same Scale as Main Map
ALABAMA
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
HOLMES
WASHINGTON
BAY
Pensacola
GULF OF MEXICO
Longitude 87° West from 86° Greenwich
A 85° B Longitude 84° West C from 83° Greenwich D E 81° F 80°
4
27°
5
26°
6
25°

from surface contamination, but in many cases somewhat hard or sulphurous. The purest artesian water is obtained in the extreme western part of the State, where the formations are essentially noncalcareous. The limestones farther east are usually more or less porous or cavernous and contain large amounts of water; and in wells that go down into the Vicksburg formation the supply appears to be inexhaustible. Water that flows without pumping is obtained in localities mostly within 100 feet of sea level, but not along the entire coast, on account of peculiarities in the dip of the strata. In 1911 nine springs reported sales of mineral water, aggregating 114,416 gallons, valued at $19,330.

Soils. The soils of Florida are very diversified and adapted to a variety of crops. Those of the uplands, except in a few of the northern counties, are prevailingly sandy and were formerly regarded as of little value; but on account of being easily worked and "warm," they are very desirable for early truck crops. The limestones, marls, and clays are exposed at the surface in many places and cause significant variations in the soils. Hammock soils (see under *Vegetation*, below), which contain considerable humus, have always been regarded as the most productive. Extensive areas of muck or peat have been drained and cultivated with profit.

The copious warm summer rain in Florida, while it supplies crops with necessary moisture, making droughts almost unknown, and prevents the accumulation of alkalies and other deleterious substances, at the same time removes from the soil a large part of the compounds of calcium, phosphorus, and potassium. Florida soils are, as a rule, rather deficient in nitrogen and potassium, though about up to the average in calcium and phosphorus, as might be expected from the extensive deposits of limestone and phosphate rock.

Topography. The topography of Florida is considerably diversified, for a region with a maximum relief of only 300 feet. The greater part of the area north and west of the base line and meridian passing through Tallahassee is a sort of plateau, dissected by many swift streams, averaging perhaps 150 feet above sea level, and having some small areas between 250 and 300 feet; but there are many local variations not easily described in a few words. Escambia Bay, near Pensacola, is bordered by high bluffs, visible from the Gulf, and elevations of 100 feet or more are found within half a mile of the water there. Another area of considerable altitude is the lake region, which extends from a few miles east of Starke down the centre of the peninsula to De Soto County, with a length of about 200 miles and an average width of about 40. This is moderately hilly throughout, except along the St. John's and Ocklawaha rivers, and some of the hills in the southern part of Lake County are probably at least 250 feet above sea level, though no exact measurements are available. This region contains many lakes, as its name implies, but very few streams. There are high red-loam hills and a few lakes in the northern tier of counties between the Apalachicola and Suwannee rivers; and a narrow belt of high land, with some points exceeding 200 feet in elevation, extends through Citrus, Hernando, and Pasco counties, on the west side of the peninsula.

A peculiar type of topography characterizes the lime-sink region, which extends from Hamilton County to Pasco County, west of the lake region. There the surface is everywhere undulating and dotted with innumerable shallow basins, from a fraction of an acre to several hundred acres in extent, only the larger of which hold water. The drainage is mostly through subterranean channels in limestone, and there are many areas 10 miles square on which there are no surface streams whatever. There are several caves and natural bridges in this and other limestone regions.

From St. Andrew's Bay eastward the country near the coast, and in some places as much as 40 miles inland, is mostly low and flat, except for a line of dunes along the east coast and low bluffs along some of the streams. The "flatwoods" areas ascend gradually towards the interior, but scarcely exceed 100 feet in elevation, except in Columbia and adjoining counties, where the inland edge of the northeastern flatwoods is about 200 feet above sea level (and higher than the country immediately southwest of it), and along Trail Ridge. This ridge extends from the north end of the lake region northward parallel to the coast some distance beyond the northern limits of the State, and its crest is over 200 feet above sea level in Florida (somewhat less in Georgia).

Streams and Springs. The Escambia, Choctawhatchee, Apalachicola, Ocklocknee, Suwanee, and several smaller rivers rise north of the borders of the State and flow into the Gulf of Mexico. Of these the Apalachicola is always, the Escambia and Choctawhatchee sometimes, and the others rarely or never, muddy. The streams confined to Florida are the St. John's, Withlacoochee, Peace, Kissimmee, and Caloosahatchee rivers and their tributaries, and a host of smaller independent systems. These are never muddy, and some of them, issuing from large limestone springs, are remarkably clear. They fluctuate very little, and floods are almost unknown in this State.

The Choctawhatchee and Apalachicola rivers are navigable for steamboats all the way across Florida, the Suwanee to Branford or occasionally to Ellaville, the St. John's for over 200 miles, and the Ocklawaha and Caloosahatchee to the lakes at their heads. The Holmes, Chipola, St. Mark's, St. Mary's, and a few other of the smaller rivers are navigated for short distances, and logs are rafted down many still smaller streams.

Most of the rivers named have so little fall that water power has scarcely been reckoned among Florida's resources; but the Withlacoochee has recently been dammed a few miles from its mouth and made to furnish electric power for several phosphate mines in the vicinity. There is a similar but smaller development on the Hillsborough River near Tampa; and among the hills of West Florida several grist mills, etc., are run by water power.

Florida is noted for its large springs, most of which are in the limestone regions. The largest whose flow has been measured is Silver Spring, in Marion County, which discharges on the average 368,913 gallons a minute. It is about 200 feet in diameter and 30 feet deep, and steamers from the Ocklawaha River come right up into it. Wakulla Spring, at the head of the Wakulla River, in the county of the same name, is about 500 feet wide and 100 feet deep and is probably the largest spring in the world.

Lakes and Ponds. Lakes are very numerous in Florida, their number having been estimated at 30,000. They occur in nearly every county in the State, but the majority of them are in the lake region in the middle of the peninsula. They vary in size from Lake Okeechobee, covering over 1000 square miles, down to a few acres, and they contribute much to the charm of Florida's scenery. Most of those in the lake region are surrounded by hills and have sandy beaches and clear water. In the flatwoods regions and some other parts of the State shallow ponds full of cypress and other aquatic trees are very common.

Coast and Harbors. The coast of Florida is over 1000 miles long, without counting indentations. The Atlantic coast as far south as Biscayne Bay is bordered by narrow sandy beaches, behind which there is an almost continuous natural waterway. The missing links of this channel have recently been supplied by canals, so that boats drawing not more than four feet can now follow an inner passage all the way from Fernandina to Miami. There are very few inlets or harbors on this long straight stretch of coast. The smooth hard beach at Ormond has been a favorite place for automobile races. From Soldier Key, a few miles south of Miami, to Key West, a distance of about 135 miles, extend the Florida Keys, a chain of low rocky islands, mostly of coralline formation, now connected with the mainland by a railroad. The Gulf coast is low and swampy from the Keys to the Caloosahatchee River, thence bordered by sand bars as far as Tarpon Springs, flat and almost devoid of beaches or islands from there to the Ocklocknee River, then mostly of the barrier-beach type to the western limits of the State.

The principal harbors or seaports are Fernandina, Jacksonville, Miami, Key West, Fort Myers; Charlotte Harbor, with the ports of Boca Grande and Punta Gorda; Sarasota, Bradentown, and other settlements at the mouth of the Manatee River; St. Petersburg, Tampa, and Port Tampa, on Tampa Bay; Port Inglis, at the mouth of the Withlacoochee River; Cedar Keys, St. Marks, Carrabelle, Apalachicola; St. Joseph's Bay, with the new settlement of Port St. Joe on the site of a town that flourished and decayed in the first half of the nineteenth century; several settlements on St. Andrew's and Choctawhatchee bays; and Pensacola and other ports on Pensacola Bay and its tributaries.

Climate. The climate of Florida varies from warm-temperate to semitropical. The average temperature ranges from 66° F. at the extreme north to 77° F. at the extreme south, and the mean January temperature from 50° F. to 69° F. between the same geographical limits. The mean July temperature is nowhere less than 80° F. or more than 84° F. The temperatures for December and August are almost the same as for January and July. The average growing season (time between last killing frost in spring and first in fall) ranges from 260 days at the north to 365 at the south. Although many places in the southern half of the State claim to be "below the frost line," freezing temperatures occasionally extend almost to Key West, which is practically the only place in the State that is exempt. The lowest temperature ever recorded in the State was 2° F. below zero, at Tallahassee, on Feb. 13, 1899. The most memorable cold waves since the advent of fruit groves were those of December, 1894, February, 1895, February, 1899, and December, 1906. Vegetables and citrus fruits in the northern two-thirds of the State have been considerably damaged by cold at several other times. Snow falls in the northern half of the State only at intervals of several years and then to an insignificant depth. It is unknown in the southern half.

The annual rainfall varies considerably in different parts of the State and in different years. The highest average figure recorded is 65.49 inches at De Funiak Springs, in the northwestern part of the State. Molino, in the extreme western part, had 98 inches of rain in 1912, Tampa had 89 inches in 1840, Fort Pierce 96 inches in 1853, and Miami 85 inches in 1906. The lowest precipitation, 38.26 inches, is at Key West; and in 1803 there was only 22 inches of rain there. The southernmost keys, curiously enough, are almost the driest part of the eastern United States, which accounts for the occurrence there of several species of cacti which are unknown elsewhere. Miami ranks next to De Funiak Springs in precipitation, having an average annual rainfall of 63.75 inches.

Throughout Florida, as in many tropical countries, there is more rain in summer than in winter. The rainy season begins and ends a little earlier in the western parts than in the eastern, but in general it may be said to cover the four warmest months (June to September inclusive). The percentage of the total annual precipitation falling in these four months ranges from 37.9 at Flomaton (just over the line in Alabama) and 44.3 at De Funiak Springs to 62.1 at Brooksville and 63.7 at Fort Myers. For the six warmest months (May to October), the corresponding percentages are 49.9 at Flomaton, 55.8 at De Funiak Springs, 74.4 at Miami, and 76.8 at Fort Myers. The seasonal percentage figures for Key West are nearly the same as for Miami, notwithstanding the great difference between the two places in total annual rainfall.

The dryness of the winters is an important factor in making Florida an ideal winter resort, and the wetness of the summers must have an important influence on soil and vegetation. By far the greater part of the summer rain comes in the daytime, in the form of brief showers, which cool the air considerably.

On account of its nearness to the ocean the whole of Florida is continually swept by winds, but these are gentle except in late summer and early fall, when West Indian hurricanes are to be expected almost anywhere on the coast, averaging about one a year. These storms often do considerable damage, and they are almost the only disagreeable feature of Florida's climate.

Vegetation. In most parts of Florida the vegetation is the most conspicuous feature of the scenery. At least 90 per cent of the original forest area is still wooded, though the forests of course have been considerably thinned by lumbermen in the vicinity of rivers and railroads. The greater part of the State is covered with parklike open forests of long-leaf pine and related species. As a rule, the flatwoods areas have a dense low undergrowth of saw palmetto and other shrubs, while in the more elevated regions the forests are carpeted with wire grass and other herbs, and there are usually some small oaks mixed with the pines.

The Everglades (q.v.) are a vast saw-grass marsh extending from Lake Okeechobee almost to the southern end of the State and covering about 5000 square miles, until lately reduced by artificial drainage. Other treeless areas, known as prairies but differing from the Western prairies in being low and subject to occasional inundation in the rainy season, are widely distributed over the peninsula.

On clayey soils in some of the northernmost counties are extensive areas of hardwood forests similar to those of adjoining States. Smaller oasis-like bodies of hardwood, known as hammocks (q.v.), are scattered among the pine forests of the peninsula. A type of vegetation peculiar to Florida is known as scrub. It is composed of Florida spruce pine (*Pinus clausa*) and a number of evergreen shrubs, with no grass and few herbs of any kind. It is most frequent in the lake region, but also occurs east and west of there. The soil of the scrub is usually a white quartz sand, of no value for agriculture, except south of latitude 28° on the east coast, where the winter climate is mild enough to permit the growing of pineapples.

Swamps of many kinds are found in all parts of the State, but are comparatively scarce in the lime-sink region and lake region. The estimates of the amount of swamp in Florida which are frequently published are considerably exaggerated, however, by the inclusion of the Everglades, which is not a swamp, in the proper sense of the word, but a marsh or wet prairie. Limited areas of salt marsh occur along the coast northward and in the extreme south these are replaced by mangrove swamps.

Flora. The flora of Florida, largely on account of its great extent in latitude (6½°), is very rich. There are at least 200 species of native trees, without counting many small ones which are usually shrubs—which is a much larger number than are found in any other State. The shrubs and herbs bring the total vascular flora up to about 3000 species. The plants in the northern half of the State are much the same as in the long-leaf-pine regions of Georgia and Alabama, while in the lake region and southward there are hundreds of species confined to Florida. The flora of the hammocks and keys of the two southernmost counties is almost wholly West Indian. Among the commonest native trees are seven or eight species of pine, two of cypress, 15 or 20 oaks, several bays, sweet gum, black gum, magnolia, hickory of several species, cabbage palmetto, red maple, and many others less familiar to the layman.

Fauna. The fauna of Florida is even richer than the flora. Of animals widely distributed in eastern North America, opossums, raccoons, rabbits, squirrels, and buzzards are common, and bears, deer, otters, wild cats, and wild turkeys are still found in the regions remotest from civilization. Snakes are probably no more abundant than in any other eastern State of similar area.

Of animals peculiar to the southeastern States and most abundant in Florida, the best known is the alligator, which is much less common now than formerly, however, owing to the depredations of hunters. The salamander and the gopher (the latter a rodent and the former a turtle) abound in dry sandy pine forests, where they spend most of their lives underground. Egrets were once common, but have been ruthlessly slaughtered for their plumes, so that they are now almost confined to a few relatively inaccessible places at the south end of the peninsula. Pelicans are frequent along the coast, but their breeding places are few in number. Smaller birds are too numerous to mention.

Of animals found nowhere else regularly in the States, the manatee, or sea cow, was formerly found along the southern coasts, but is now almost extinct. Crocodiles are occasionally seen in the extreme south. Sponges are gathered in the Gulf of Mexico near Carrabelle, Cedar Keys, Tarpon Springs, and Key West.

Mining. The only mineral product of great importance in the State is phosphate rock. This constitutes nearly one-half of the value of the total mineral output. Although it was known as early as 1884 that valuable deposits of phosphate rock existed in the State, production on a commercial scale did not begin until 1889. The value of phosphate produced in Florida was in 1909 $8,488,801 and later approximated $10,000,000 annually. Formerly, four kinds of phosphate rock were produced—hard rock, soft rock, land pebble, and river pebble. Soft rock has not been produced in recent years, and only an insignificant amount of river pebble is now mined. Hard rock is generally of higher grade than pebble and at one time was the only phosphate for which there was any demand for export.

During recent years, however, the grade of land-pebble phosphate has been greatly improved by the methods of mining and treatment employed, and the export shipments from Florida now include not only practically all the hard rock produced, but also a considerable part of the land pebble. In 1912 foreign shipments of phosphate rock from the State amounted to 1,203,005 long tons. This was about 700,000 tons more than the total production of hard rock. The difference represented the quantity of pebble exported and was a little more than one-third of the pebble production. In 1912 the total production of phosphate rock in the State was 2,406,899 long tons, valued at $9,461,297, of which the combined production of land and river pebbles constituted 1,913,418 long tons, valued at $6,168,129, while the output of hard rock was 493,481 long tons, valued at $3,293,168. Florida is by far the leading State in the production of phosphate rock, the output representing over 80 per cent, both in quantity and value, of the total output in the United States. The production in 1926 was 2,708,207 long tons. The leading producing counties are Polk, Alachua, Citrus, Hillsborough, and Marion.

Florida is next after Georgia in the production of fuller's earth, a variety of clay used chiefly for filtering and clarifying animal, mineral, and vegetable oils. The production of this mineral, while relatively large for that industry, is of minor importance when considered with the State's total mineral production. No figures of production in 1912 can be given on account of the fact that the information given to the United States Geological Survey by producers is confidential. The production in 1909 was valued at $203,236 and in 1911 was 27,658 short tons, valued at $265,571. Florida also leads in the production of ball clay, a very plastic clay used in giving plasticity to the body of high-grade pottery. The manufactured clay products of the State, valued in 1926 at $465,960, were nearly all in brick. The manufacture of sand-lime brick, an industry of considerable importance, attained a total of $223,-

896 for 1926. Production of stone increased rapidly after 1924, to a total for 1926 of 6,785,430 short tons, $7,411,506 in value. Other mineral products are lime, mineral waters, sand, and gravel. The total value of all mineral products of Florida in 1909 was $8,915,181 and in 1926 it was $19,700,522.

Agriculture. The low altitude of Florida governs its agricultural conditions. A large portion of the southern part of the State is at such a low elevation that it does not drain readily, with a result that large areas are swampy. The Everglades (q.v.) are occupied by deep, mucky soils, which rest usually upon the limestone of that section. North of the Everglades region occurs the flatwoods portion of the State, where the soils are prevalently dark-gray sandy loams, with many areas of muck. The extreme northern and northwestern portions consist of a more elevated and rolling portion of the coastal plain, where the soils are dominantly yellow and gray sands and sandy loams underlain either by yellow clay or red clay subsoil. Of the State's entire land area, only 16.7 per cent in 1925 was in farms. In 43 counties, the farm area is less than 20 per cent, while in the remaining counties the percentage is somewhat higher.

While the population of the State has increased rapidly in recent years, the number of farms increased but 9201 from 1910 to 1925. During the same period, there was an increase of about 611,000 in the total farm acreage. The total number of all farms in the State in 1910 was 50,016; in 1925 it was 59,217. Out of an approximate land area of 35,111,040 acres, the land in farms in 1925 amounted to 5,864,519 acres and the crop land in farms was 2,022,284 acres. The average number of acres per farm in 1925 was 99, while in 1910 it was 106.9.

In 1925 the total value of all farm property including land, buildings, implements and machinery, domestic animals, poultry, and bees, was $513,884,122, compared with a value of $143,183,183 in 1910 and of $53,929,064 in 1900. The average value of all property per farm rose from $1321 in 1900 to $2863 in 1910 and to $8078 in 1925; while the average value of land per acre increased from $7.06 in 1900 to $17.84 in 1910 and to $70.91 in 1925. Of the total number of all farms in 1925, 46,596 were operated by owners and managers, while 12,621 were operated by tenants. In the 48 years since 1880, the number of owners and managers combined had increased continuously from 16,198 to 46,596, or 187 per cent, and the number of tenants had increased from 7240 to 12,621, or 74.3 per cent. The tenants constitute 21.3 per cent of the total number of Florida farm operators. This is considerably lower than the average for the South Atlantic States as a whole, which is 44.5 per cent.

Of the owned farms in 1925, 8857 were reported as mortgaged. The average debt per farm was $2188 and the average mortgage debt to the acre was $20.10.

The number of farms owned, operated, or leased by white farmers in the State in 1925 amounted to 47,205, while the farms owned, managed, or leased by colored farmers amounted to 12,012. The improved land in farms owned, operated, or leased by white farmers in 1910 was 1,323,055 acres, while that owned, operated, or leased by colored farmers was 482,353 acres. The value of the land and buildings on the farms owned by white farmers was $106,230,421, while that of those owned by colored farmers was $11,915,568. Of the total number of farmers in the State in 1910 (50,016), 34,080 were native whites, while 14,721 were negroes and other non-whites. The foreign-born white farmers numbered 1215. Of the native white farmers, 17.5 per cent were tenants, and of the foreign-born white, only 5.8 per cent were tenants. Among the non-white farmers, the tenants constituted about half (49.7 per cent) of the total number.

The general characteristics of agriculture in the State are shown by the following table, giving the acreage, production, and value of the principal farm crops in 1927 and 1928. The figures for both years are estimates from the United States Department of Agriculture given in its crop reports.

CROP	YEAR	ACREAGE	PROD. BU.	VALUE
Corn	1928	607,000	7,891,000	$7,891,000
	1927	573,000	7,449,000	7,226,000
Potatoes	1928	31,000	3,875,000	5,812,000
	1927	20,000	3,045,000	5,633,000
Sweet potatoes	1928	28,000	2,464,000	2,834,000
	1927	20,000	2,668,000	2,268,000
Cotton	1928	101,000	20,000 *	1,790,000
	1927	67,000	17,000 *	1,624,000
Tobacco	1928	12,000	9,221,000 †	2,687,000
	1927	8,800	8,228,000 †	2,865,000
Hay	1928	92,000	67,000 ‡	1,261,000
	1927	99,000	67,000 ‡	1,209,000
Peanuts	1928	44,000	25,300,000 †	1,068,000
	1927	44,000	28,160,000 †	1,042,000
Oranges	1928	......	12,000,000 §	25,800,000
	1927	......	8,200,000 §	32,800,000
Grapefruit	1928	......	8,000,000 §	20,400,000
	1927	......	7,200,000 §	22,320,000

* bales † pounds ‡ tons § boxes

It will be seen from this table that the leading field crops, given therein in the order of their importance, are corn, potatoes, sweet potatoes, tobacco, and cotton. Peanuts, which appear in this table, were third in value in 1909, amounting to $2,146,862. The production of tropical fruits, however, the statistics of which are treated under *Horticulture*, is more important than any crop included in the table. Corn exceeds in acreage and value any other crop included in the table, representing about 93 per cent of the total acreage and value of the cereals. The greater part of the remainder is contributed by oats. The acreage of cotton is about one-sixth that of the combined cereals and its value more than one-fifth their value. The acreage of peanuts in 1928 was about one-fourteenth that of the cereals and the value of the crop was approximately one-eighth as great. Corn has shown steadily increased production in recent years. Florida is one of the two southern States east of the Mississippi River which shows increases in the acreage of corn in the decade 1900–10. Wheat was formerly grown to a considerable extent, but has declined; the acreage of hay and forage has shown a rapid and steady increase since 1899.

The production of cotton in Florida has fluctuated considerably in the past few decades. Cotton is grown almost entirely in the northern half of the State. Jackson County has more than one-sixth of the total cotton acreage. In the acreage and production of peanuts, the leading county is also Jackson. About 88 per cent of the tobacco acreage is in Gadsden County. In 1909 there were grown 142,517 tons of sugar cane. Sugar-cane cultivation on the reclaimed Everglades land has been a subject of extensive tests. The growing of vegetables is one of the most important agricultural industries of the State. In 1927 the total acreage of vegetables and fruit included watermelons, 29,420; snap beans, 19,490; lettuce, 1840; tomatoes, 29,800; peppers, 2700; green peas, 700; cucumbers, 7440.

Live Stock and Dairy Products. The total value of the live stock in 1925 was $20,438,591. The cattle on the farms numbered 656,217, valued at $7,593,993; horses, 28,848, valued at $2,504,193; mules, 42,656, valued at $5,027,996; swine, 497,780, valued at $2,755,173; sheep, 59,729, valued at $184,245. The number and value of live stock on Jan. 1, 1914, was estimated by the United States Department of Agriculture as follows: cattle, other than milch cows, 735,000, valued at $10,070,000; milch cows, 128,000, valued at $4,864,000; sheep, 118,000, valued at $224,000; swine, 904,000, valued at $5,424,000; horses, 55,000, valued at $6,710,000; mules, 27,000, valued at $4,536,000.

Horticulture. The most important fruits produced in Florida are tropical and the growing of these forms the State's most important industrial activity. The most important are oranges, grapefruit, and pineapples. Orange culture became prominent in Florida about 1875, in the central section, and from that date rapidly grew in importance, although the industry was seriously hindered for several years by severe frosts. The winters of 1887, 1894, and 1899 were unusually severe, and this resulted in a serious setback in this industry. Disastrous frosts, however, are rare, and can now be combated by means of the smudge. Pineapples are grown along the east coast. Several of the west-coast counties have in recent years become prominent in the production of oranges. In addition to the fruits mentioned, lemons, limes, avocado pears, bananas, mangoes, Japanese persimmons, sapodillas, guavas, and figs were grown. Other tropical products include coconuts. The total number of tropical fruit trees, vines, or plants of bearing age in 1910 was 39,761,368. The value of the fruits produced in 1909 was $7,092,150, more than half this value being contributed by oranges and most of the remainder by pomeloes (grapefruit) and pineapples. The total value of tropical fruits increased from $946,000 in 1899 to $7,092,000 in 1909. In 1909 the fruit crop suffered from a severe frost.

The principal tropical fruit crops grown in Florida in 1911–12, with their values, were as follows: oranges, 4,769,312 crates, valued at $5,665,415; grapefruit, 1,405,308 crates, valued at $2,684,525; pineapples, 355,658 crates, valued at $383,155; lemons, 11,810 crates, valued at $32,763; limes, 35,417 crates, valued at $61,770; avocado pears, 19,373 crates, valued at $53,730; bananas, 27,061 bunches, valued at $18,633; mangoes, 26,559 crates, valued at $26,346; Japanese persimmons, 4376 crates, valued at $6653; sapodillas, 4051 crates, valued at $5210; guavas, 56,172 crates, valued at $49,281; figs, 16,534 crates, valued at $25,585. The production of oranges and grapefruit in the State in 1928 was: oranges, 12,000,000 boxes, valued at $25,800,000; grapefruit, 8,000,000 boxes, valued at $20,400,000. Of limes, 6000 boxes were produced; of pineapples, 9000. The chief orange-producing counties were Orange, Volusia, Brevard, Hillsborough, Putnam, Lake, DeSoto, and Polk. The counties in which the largest number of grapefruit is produced are Dade, Lee, Manatee, Pinellas, Lake, Palm Beach, Orange, St. Lucie, and Brevard. The principal counties producing pineapples are St. Lucie, which produces by far the largest proportion, Dade, Palm Beach, and Lee.

The State has long produced considerable quantities of orchard fruits, the total value of these in 1909 being $232,203. The most important in point of value were peaches and nectarines. Peaches in 1928 were grown to the value of $151,000. Pears were valued at $49,000. In 1911–12 the production of peaches was 178,566 bushels, valued at $225,576; pears, 30,993 barrels, valued at $78,258; plums, 17,716 bushels, valued at $23,072. The grapes produced in the State in 1909 amounted to 1,086,344 pounds, valued at $38,357. In 1911–12 the production of grapes was 1,054,945 pounds, valued at $74,581. There were made in that year 20,354 gallons of wine, valued at $19,968. Grape production in 1928 was about 1,800,000 pounds. The nuts produced in 1909 were valued at $47,456, the most important of these being pecans. In 1911–12 16,893 bushels of this nut were produced, valued at $94,887. Pecan production in 1928 was 800,000 pounds.

Strawberries are the only small fruit raised on a considerable scale. The production in 1909 amounted to 2,383,397 quarts, valued at $301,056. The production in 1911–12 was 3,513,108 quarts, valued at $482,845. That of 1928 was 5,096,000 quarts; in value, $1,784,000.

Manufactures. Florida is not a manufacturing State, but its industrial activities have developed greatly in recent years. A number of navigable streams and the extensive coast line afford the manufacturing interests cheap transportation. All four of the cities industrially longest established—Jacksonville, Key West, Pensacola, and Tampa—have extensive docking facilities. Railroad transportation is good and has lately reached the Everglades region of southern Florida.

The growth of manufacturing is shown by the fact that in 1849 the industrial establishments numbered 103, with a product valued at $668,335, while in 1909 there were 2159 establishments giving employment to an average of 57,473 wage earners, or 7.6 per cent of the total population. During this period, the gross value of products per capita of the entire population of the State increased from $8 to $97. From 1849 to 1909, the proportion which the manufactures of the State represent of the total value of products of manufacturing industries in the United States increased more than fourfold. This proportion was less than 1/10 of 1 per cent in 1849 and was nearly 4/10 of 1 per cent in 1909.

It was until recently the case that the most important industries were those connected with tobacco manufacture. There were 229 establishments engaged in these manufactures in 1909, employing 12,280 wage earners, their products valued at $21,575,000. These industries, which include chiefly manufactures of cigars and cigarettes, are confined largely to the southern portions of the State, particularly to Tampa and Key West, and are the outgrowth of the immigration of Cubans to this section of the State. A large part of the raw tobacco is imported from Cuba. The importance of the lumber and timber products is shown by the fact that as early as 1909, they ranked second to tobacco in importance and ranked first in value added by manufacture. The value of the lumber and timber products in 1909 was $20,863,000. This industry then gave employment to the largest number of wage earners, 19,227. Third in rank were industries connected with the production of turpentine and rosin. In 1909 Florida produced 47.2 per cent of the total value of these commodities produced in the United States and occupied first place among the States in their production. They gave employment in 1909 to 18,143 wage earners, and the value of the product was $11,938,000. For additional notes on the production of fertilizers, see the paragraph *Mining* above. The total value of the fertilizer products in 1909 was $3,878.000. There were only four other industries the value of whose product in 1909 exceeded $1,000,000. These were printing and publishing, cars and general shop construction, bread and other bakery products, and the manufacture of ice.

The average number of persons engaged in manufactures during 1909 was 64,810, of whom 57,473 were wage earners. Of the wage earners over 16 years of age, 53,520 were male and 3012 female. The wage earners under 16 years of age numbered 941. Of the total number of wage earners employed, 53.5 per cent were in establishments where the prevailing hours of labor were from 54 to 60 hours per week and 15.9 per cent in establishments where there were more than 60 a week.

The concentration of industries in the larger cities is shown by the fact that in 1909, with only 18.4 per cent of the total population of the State, cities having over 10,000 inhabitants reported 41.6 per cent of the total value of manufactured products and 25 per cent of the total average number of wage earners engaged in manufacturing. Tampa, although ranking second in population, was easily first when measured either by the average number of wage earners or by the value of products. There were in 1909 an average of 8996 wage earners, and the value of products in that year was $17,653,021. The leading industry is the manufacture of cigars and cigarettes, the value of which amounted to $14,557,329 in 1909. This city was the only one which showed an increase in the number of wage earners in the five-year period 1904–09. Key West showed decreases in the value of its products and the average number of wage earners, while Jacksonville and Pensacola showed decreases in the average number of wage earners. In Key West, the manufacture of cigars and cigarettes was the leading industry, while in Jacksonville the leading industry, measured by value of products, was the manufacture of fertilizers. Pensacola, which had no single industry which contributed any great portion of its total value of products, except lumber manufactures, showed on the whole the greatest diversity of manufacturing industries.

The manufactures of Florida proceeded at a normal rate of growth from 1909 to 1914; but in the period 1914–27, they made an exceptional advance. The increase in the annual value of manufactured products up to 1925 was the highest attained, in ratio to the figures for 1914, in any of the six South Atlantic States save North Carolina; for the South Atlantic States, the rate of increase was in turn much greater than that for the country as a whole. The yearly total of manufactured products was 229 per cent higher, for Florida, in 1925 than in 1914. This increase was almost 1.5 times that of the corresponding rate for the entire Union, which was 159 per cent. While this increase must in part be discounted as representing the alteration in the purchasing power of money that had come about with the world-wide economic incidents of the period, it was evident that the manufacturing production of Florida had expanded much too greatly to be ascribed to this cause alone or chiefly. The deflation of a real estate boom after 1925 resulted in reduced production for 1927.

The manufactured products of the State had a total value, for 1914, of $81,112,000; the yearly total rose to $213,327,000 for 1919, which roughly coincided with the peak of industrial activity occasioned by the World War. It then declined, as in other States, reaching $144,026,000 for 1921; but recovery ensued, and for 1923 the total was $185,209,000. From then through 1925, in a period corresponding with a wave of migration to the State, and of very rapid development connected with a great enhancement of real estate values, manufacturing activities moved sharply upward, the total product reaching $267,009,000 for 1925. Manufactured products for 1927 totaled $218,790,152. The number of the wage earners in the manufacturing industries did not increase from 1914 to 1927, in proportion to the total output. There were in 1914, 55,608 such wage earners; the number rose to 74,415 for 1919, fell to 53,224 for 1921, a figure somewhat below that of 1914, rose again to 64,975 for 1921, and to 66,780 for 1925. This number was less than 20 per cent higher than that for 1914. In 1927 wage earners numbered 61,219. The total of manufacturing wages made a considerably greater increase than that of the number of workers. While but $24,822,000 were paid in manufacturing wages in 1914, the total of such payments for 1925 was $65,780,000, or not far from 2.6 times the earlier year's total. The average yearly manufacturing wages thus rose from about $446 for 1914 to very nearly $1000 for 1925. Wages for 1927 totaled $56,671,574.

Owing to the absence on the one hand of water-courses of sufficient descent to permit of the generation of any considerable total of hydroelectric power, and on the other, of coal resources within the territory of the State, the manufacturing industries of Florida remained in 1925 but slightly mechanized. The primary horsepower in use in the manufactories in 1925 totaled 153,213; it had increased from a total of 47,296 in 1914. The ratio of yearly value added to goods by manufacture, as compared with the total manufacturing horsepower, was in 1925, more than $1000. It was more than twice as high as the corresponding ratios for the neighboring States of Georgia, Alabama, and South Carolina. Certain of the industries of the State, and particularly of those contributing largely to its manufacturing totals, retained the character of manual production to a great extent.

With regard to the total value of the yearly product of each, the most important industries of the State in the year 1925 were timber and lumber, with an output valued at $64,346,386, cigars and cigarettes, of which the production was $40,488,308, and railroad repair shops with a total of $12,895,731. The railroad repair industry, however, belonged to the type known as maintenance industries and had a strictly local application as well as being by its nature little more than a phase of the transportation industry. The cigar-making industry, on the other hand, was distinctive of the State and formed the basis of a very considerable shipment to other markets than its own. Cigars and cigarettes were made in 120 establishments, employing in 1925 11,644 wage workers, who received a total of $12,472,487 in yearly wages. In proportion to the total production value, the value added by manufacture in this industry was conspicuously high, being not far from 60 per cent. The industry, as in earlier years, remained highly localized. The extraction of turpentine and rosin, an industry closely connected with that of lumber, was a feature of the manufacturing activity of the State; in this activity 10,890 wage earners were employed in 1925 and the year's product attained a value of $14,110,363. The fertilizer manufacturing industry employed, in 1925, 972 wage earners and produced goods of a total value of $12,132,107. In 1925 about one-half of the manufactures were produced in the cities of Jacksonville, Key West, Miami, Pensacola, St. Petersburg, and Tampa. Tampa produced $55,446,901, Jacksonville $49,314,650, and Miami $22,207,524.

Forest Products. A bulletin of the United States Bureau of Corporations issued in January, 1913, estimated the area of private timber holdings in Florida at 17,560,000 acres, or more than half the State; and the amount of standing timber at about 74,000,000,000 feet, board measure. Of this timber, pine was estimated to constitute 80 per cent; cypress, 14½ per cent; and hardwoods, 5½ per cent.

The survey of 1925 reported 220 sawmills in the State, with the following production of lumber, laths, and shingles for the year 1909: pine (of several species, but mostly long-leaf), 793,730,000 feet; cypress, 257,125,000; hickory, 1,002,000; oak, 1,160,000; yellow poplar, 1,428,000; cedar, 69,000; cottonwood, 180,000; ash, 1,067,000; red gum (sweet gum), 3,146,000; tupelo gum, 4355; elm, 9000. Total, 1,063,876,000. These figures do not include wood used for fuel, crossties, poles, posts, staves, veneers, etc., or other forest products such as tanbark and naval stores (i.e., rosin and turpentine).

Florida is now the second State in the production of naval stores (q.v.), which are obtained from the long-leaf and one or two other pines. The Turpentine and Rosin Producers' Association reported the 1925 production of turpentine at 8,650,050 gallons, and of rosin at 750,837 barrels, the figures for both of these commodities being a little more than one-third of the total for the United States.

Fisheries. The fisheries of the State are of great importance. It is said that 600 species of fish are found in Florida waters and many of these are not found elsewhere. Among the large specimens hunted for sport are the tarpon and kingfish. The value of the product for the year 1923, the latest year for which complete statistics are available, was $5,746,148. Of the species of fish taken, the most important in value was mullett. The 1923 catch of mullett was $1,319,587. Next in order of rank were sponges, of which a quantity valued at $871,572 was taken. Shad was caught to the value of $62,447; red snappers caught in 1923 were valued at $681,008; Spanish mackerel were valued at $496,076; squeteague, or sea trout, were valued at $280,023; shrimps were valued at $499,870; terrapin and turtle, formerly an important fishery, no longer provided an important catch. Oysters were valued at $86,399. The alligator hides taken during the year had a considerable commercial value. The total number of fishermen in the State in 1923 was 7661. The sponge fisheries, carried on largely by Greeks, were active and growing.

Transportation and Commerce. The State has exceptional facilities for water transportation and is also well provided with communication by land. The number of miles of main railroad line which was under operation in the State on Jan. 1, 1928, was 5707.97. There was much railroad construction in southern Florida in 1925–27. The railways having the longest mileage on Feb. 28, 1914, were the Atlantic Coast Line, 1527; the Seaboard Air Line, 978; the Florida East Coast, 637; the Louisville & Nashville, 245; the G. S. & F., 152; and the Apalachicola Northern, 102. The Florida East Coast Railway was completed to Key West on Jan. 22, 1912. Its construction over the Keys was one of the most remarkable engineering performances in the history of railroad building. The railroad forms a continuous route from Jacksonville to Key West, and for the last 100 miles of this distance is carried across keys and channels by means of embankments and viaducts. The general regulation of the railway rates is in the hands of the State Railroad Commission. The Federal government has made many important improvements in the harbors of the State. In 1911 work was begun on a channel, 30 feet deep and 300 feet wide, from Jacksonville to the ocean. Other improvements have been made in the St. John's River channel, at the channel in Apalachicola Bay, and in the channel at Pensacola. In the latter harbor, a channel 30 feet deep and 500 feet wide has been completed from the Gulf to the city docks. An idea of the magnitude of the commerce of the ports of Florida is given by the fact that, in the calendar year 1926, there was a total tonnage of 1,583,950 entered in the foreign trade, while a tonnage of 1,322,953 was cleared in the foreign trade in the same period.

Education. Educational conditions in Florida have been far from satisfactory, but considerable improvement has been made in recent years. The same problem which confronts other Southern States which have a great preponderance of rural population and a large percentage of negroes is present. In 1920, 71,811 out of the total population of 10 years of age or over were illiterate, or a percentage of 9.6. That conditions are improving is shown by the fact that in 1900 there were 84,285 illiterates, or 21.9 per cent. The percentage of illiteracy among whites of native parentage in 1910 was 5.2 per cent, and among whites of foreign or mixed parentage, it was 9 per cent. Among the foreign-born whites, it was 10.5 per cent. The percentage of illiteracy among the negroes was, in 1920, 21.5. This declined from 38.4 in 1900. Although the percentage of illiteracy is high, it is exceeded in eight other Southern States. The school population of the State in 1925 was 310,555. Of these, an average of 250,355 pupils attended school during the year; thus about four-fifths of the school population in 1925 were school attendants during that year. The native-white school population in 1910 was 124,330 and, of these, 74,638 attended schools. The native whites of foreign or mixed parentage in the school population was 12,942, of whom 7671 attended schools. The foreign-born white school population was 5318 and, of these, 1704 attended school. The negro school population was 101,285, of whom 44,634 attended school during the year. According to the report of the State Superintendent of Public Instruction, the approximate school population in 1913 was 256,418. The total enrollment in the public schools in the school year 1925–26 was 342,043, of which high-school enrollment was 35,040. The teachers numbered 10,435, of whom 1221 were male and 9214 female. The average salary of teachers, supervisors, and principals was $831 a year. The average length of the school term in 1925–26 for white schools and for negro schools combined was 150.1 days.

The total expenditure for education in 1911–12 was $2,724,410. Of this sum, $2,029,899 was expended for white schools and $297,495 for negro schools. The total number of high schools in the State in 1912 was 83. Of these, 25 were two-year schools; 10, three-year schools; and 48, four-year schools. The value of high-school buildings was $1,305,550. The 83 high schools were located in 47 counties, and 3 counties of the State had no high schools. Provision was made by the Legislature of 1911 for the adoption of uniform textbooks throughout the State, and also for free textbooks to any child under 15 whose parents were on the roll of the county poor or were indigent or dead. In 1925 the expenditure for public-school education was: current, $15,591,919; outlay, $14,497,559. In 1905 all the State institutions for higher education were merged into the University of Florida (see FLORIDA, UNIVERSITY OF) at Gainesville, and the State College for Women at Tallahassee. Other institutions of higher learning include the John B. Stetson University at DeLand, the Southern College at Sutherland, and Rollins College at Winter Park. The last three are coeducational. There is also a Roman Catholic college, the St. Leo College and Abbey at St. Leo. Schools for negroes include the State Agricultural and Mechanical College for negroes at Tallahassee, the Cookman Institute, and the Boylan Industrial School and Home for Colored Boys at Jacksonville. Summer schools are held at Gainesville, Jacksonville, Lakeland, Madison, Marianna, Milton, Pensacola, Sutherland, and Tallahassee.

Finance. The report of the State finances for the fiscal year ending June 30, 1926, showed a balance at the beginning of the year of $8,041,309. The receipts amounted to $44,495,645 and the disbursements to $32,954,700, leaving a balance on hand on June 30, 1926, of $19,582,254. The chief disbursements were for the executive department, for education, and for expenses of the government. The public debt of the State is nil. Debt is limited by constitutional amendment of 1920 to purposes of defence and to highway building. The State is regarded, however, as contingently liable for indebtedness of the Everglades Drainage District. In 1912 a constitutional amendment was adopted empowering the Legislature to provide for special tax districts and to issue bonds for free public schools.

Banks. On Oct. 10, 1927, there were in the State 63 National banks, with deposits subject to check, or other, amounting to $221,482,000, including savings deposits. There were in the State under the supervision of the Comptroller of the State of Florida, 194 State banks, 68 loan and trust companies, and 3 stock savings banks. No private banks were reported. All banks numbering 327, had resources of $562,565,000.

Charities and Corrections. The charitable and correctional institutions of the State include the State Institute for the Deaf, Dumb, and Blind at St. Augustine, the Florida Industrial School for Boys at Marianna, the Hospital for the Insane at Chattahoochee, and the Confederate Soldiers' and Sailors' Home at Jacksonville. The State retained the custom prevalent in the Southern States of employing its convicts at labor. Up to Dec. 31, 1913, the State prisoners able to labor were leased to the Florida Pine Company. The Legislature of 1913 passed a measure directing the Board of Commissioners of State Institutions to allot to the several counties such able-bodied male prisoners as might be desired for work on the public roads at a uniform rate of $120 per annum per capita. Only 50 convicts were taken by the counties under this provision of the law. The remaining able-bodied male prisoners were then, in accordance with this act, leased to individuals and corporations throughout the State on competitive bids. The white male prisoners were leased at the rate of $250 per annum per capita, and the colored male prisoners at the rate of $283.15 per annum per capita. These leases were for two years only. Laws were later passed against the maltreatment of prisoners, of which there had been flagrant cases. Under the lease made in 1913, all able-bodied male prisoners except those engaged in county road work were worked on turpentine farms. The second-grade male prisoners and all female prisoners were excepted from lease by the Act of 1913. Those able to do any manual labor were employed at the State-prison farms at Raiford and Ocala. The Ocala farms contain something over 600 acres and general farming is carried on. The Raiford farms contain 15,000 acres and in 1914 were being put in preparation for cultivation. In that year, about 130 of the second-grade male prisoners were confined at Raiford and were engaged in the erection of buildings, the preparation of lands for cultivation, and other improvements. The Legislature of 1923 abolished flogging in convict camps and restricted convict labor for private interests. Other acts relating to charities and corrections passed by the Legislature of 1913 were measures providing for the employment and compensation of county probation officers and an act changing the name of the State Reformatory to the Florida Industrial School for Boys and forbidding the commitment of girls to that institution after Jan. 1, 1914. County judges in the State are required to act as judges of juvenile courts and to keep separate juvenile records.

Population. Following are the figures of population of the State by decades: 1830, 34,730; 1840, 54,477; 1850, 87,445; 1860, 140,424; 1870, 187,748; 1880, 269,493; 1890, 391,422; 1900, 528,542; 1910, 752,619; 1920, 968,470. The estimated population in 1928 was 1,411,000. A State census in 1925 found the population to be 1,263,549. In 1920 Florida ranked thirty-second among the States in population. The percentage of increase in the decade 1900–10 was 42.4; that from 1910 to 1920, 28.7. The population per square mile in 1920 was 17.7. Of the total population in 1920, 355,825 lived in places of a population of 2500 or more. This was an increase of 62 per cent in urban population in the decade 1910–20. The rural population in 1920 was 612,645, an increase of 14.8 per cent in the decade. The white population in 1920 numbered 638,153 and the negro population, 329,487. The white population in 1900 numbered 297,333; the colored population, 230,730.

Of the white population enumerated in 1910, 373,967 were of native parentage, 35,825 were of foreign or mixed parentage, and 33,842 were of foreign-born parentage. By sex, the population in 1920 was divided into 495,320 males and 473,150 females. The persons of voting age numbered 536,614. The cities exceeding 10,000 inhabitants with their populations in 1910 and 1920 are as follows: Jacksonville, 1910, 57,699; 1920, 91,558; Tampa, 1910, 37,782; 1920, 51,608; Pensacola, 1910, 22,982; 1920, 31,035; Key West, 1910, 19,945; 1920, 18,749; Miami, 1910, 5471; 1920, 29,571; St. Petersburg, 1910, 4127; 1920, 14,237. Tallahassee, the capital, had in 1910 a population of 5018 and, in 1920 of 5637.

Religion. About one-half of the church members of Florida belong to the Methodist church; more than two-thirds of the remainder are Baptists; other denominations represented are Catholic, Presbyterian, Protestant Episcopal, Disciples of Christ, Congregational, and Lutheran. Of these, the Roman Catholics are the strongest.

Indians. For hundreds of years, the Seminole Indians of Florida made their homes in the Everglades and obtained a living by hunting, trapping, and fishing. In 1914 there were about 400 of these Indians who lived in camps surrounded by vast tracts of uninhabited swamps and morasses. They are the remnant of the band of the famous chief Osceola, whose savage forays upon settlers in the early history of the State resulted in a series of wars among the fiercest ever carried on by the United States government against Indians. On account of the various drainage projects now being undertaken for the reclamation of the Everglades, and the diminishing swamp area which has been their home and hunting ground, these Indians are rapidly being deprived of the game upon which they have heretofore subsisted. They are only in a limited sense agriculturists, but are natural hunters and trappers, making fully 75 per cent of their expenses of living from alligator skins. In addition to the restriction of their hunting grounds, during 1913 the tanneries discontinued the purchase of alligator skins. The Florida State Legislature in 1889 set aside 36 townships as a Seminole Reservation; but while the law apparently has not been repealed, nearly all the land has been obtained by private persons. A measure was passed in 1917 granting the tribe 100,000 acres near the Ten Thousand Islands. During the period from 1895 to 1900, 23,061 acres, with funds provided by Congress, were purchased for these Indians, and on Nov. 22, 1897, there were withdrawn for them approximately 480 acres. Congress appropriated $10,000 for the relief of these Indians in 1913, and a special commissioner was appointed to look after their interests. All efforts for their education on the part of the State and Federal governments and missions have been unsuccessful because of the severe penalty inflicted by the tribal laws on any Seminole who learns to read and write. They are splendid types of the physical man and are nearer the aboriginal Indian in habits and customs than almost any other band in existence.

Militia. The militia of the State consists of the infantry, field artillery, and harbor defence troops. The total strength of enlisted men on June 30, 1928, was 2287, and of officers, 154. The designation is the National Guard of Florida.

Government. The present constitution of the State was adopted by a constitutional convention held in 1885, was ratified by the people on Nov. 2, 1886, and went into effect on Jan. 1, 1887. The instrument has since been amended, but in no important detail. Either branch of the Legislature at a regular session may propose amendments to the constitution, and if these are agreed to by three-fifths of all the members elected to each House, the proposed amendment is voted upon by the people at the next general election. The Legislature by a vote of two-thirds of all the members of both houses has the power to determine whether a revision of the constitution shall be submitted to the electors. If a majority of the electors voting are in favor of a revision, the Legislature must provide by law for a convention to revise the constitution to be held within six months after the passage of the law. The convention shall consist of a number equal to the membership of the House of Representatives and is apportioned among the several counties as are members of each House.

This constitutional provision was to have had the apparent effect of rendering the State hospitable to persons of wealth seeking a legal residence where they might find security from the prospect of double taxes on estates. The action taken by Florida was a cause of antagonism in other States imposing estate or death duties, as these apprehended the loss of taxable residents that might occur in case the exemption offered in Florida should prove an incentive to their wealthy residents to move to the latter State. There followed Federal legislation whereby the Federal government undertook to surrender to States imposing estate duties such sums as they might levy on estates of their decedent residents, up to 80 per cent of the Federal levies on such estates; Florida opposed this proceeding without effect.

Legislative.—The Legislature of the State consists of a Senate and House of Representatives. Sessions of the Legislature are held biennially, beginning on the first Tuesday after the first Monday in April. The Governor may convene the Legislature in extra session by proclamation. Regular sessions of the Legislature may extend to 60 days, but no special session convened by the Governor may exceed 20 days. The Senate consists of not more than 32 members and the House of Representatives of not more than 68 members. The members of the House of Representatives are elected for terms of two years, and the members of the Senate for four years.

Executive.—The supreme executive power of the State is vested in the Governor, who holds office for four years and is not eligible for reëlection for the next succeeding term. The other executive offcers of the State include the Secretary of State, Attorney General, Comptroller, Treasurer, Supertintendent of Public Instruction, and Commissioner of Agriculture. These are elected at the same time as the Governor and hold office for the same term. The Governor is a member of the Board of Pardons, of which the other executive officers also are members, with the exception of the State Superintendent of Public Instruction. The Governor, Secretary of State, Attorney General, Comptroller, Treasurer, Superintendent of Public Instruction, and Commissioner of Agriculture comprise a Board of Commissioners of State Institutions. The Governor also is a member of the Board of Education. The salary of the Governor is $10,000 a year.

Judiciary.—The judicial power of the State is vested in a supreme court, circuit courts, criminal courts, county courts, county judges, and justices of the peace. The supreme court consists of five justices, elected for a term of six years. The chief justice is designated by lot. A majority of justices of the supreme court constitute a quorum for the transaction of all business. There are nine justices of the circuit courts, appointed, for a term of six years, by the Governor, subject to confirmation by the Senate.

The circuit courts of Florida have exclusive original jurisdiction in all cases of equity and they have final appellate jurisdiction in all civil and criminal cases arising in the county court. County judges have original jurisdiction in all cases of law in which the value of property involved does not exceed $100. In counties where there is no county court, justices of the peace have jurisdiction in such cases. The term of the judges of the county courts is four years.

Suffrage and Elections.—Qualified electors include every person of the age of 21 and over who shall at the time of registration be a citizen of the United States and shall have resided in the State for one year and in the county for six months. Payment of poll taxes for the two years preceding an election (for one year in the case of persons who have been resident in the State for only a year) is a qualification for voting. General elections are held on the Tuesday next succeeding the first Monday in November, dating from 1906, and biennially on the same day thereafter. Voting is by secret official ballot. To conform with the Seventeenth Amendment of the Federal Constitution, the Legislature of 1913 passed a measure providing for the election of senators at the general election held next preceding the expiration of the terms of office of the senators. In the event of a vacancy in the Senate, the Governor shall issue writs of election to fill the vacany at the next general election, and he may make temporary appointments until the vacancy is filled by such an election.

The primary election law, enacted in 1913, provided for the nomination of all candidates for all elective, State, congressional, and county offices, for the United States Senate, and for the election of members of the State, congressional, and county executive committees. Any political party which, at the general election for State and county officers next preceding a primary, has polled more than 5 per cent of the entire vote cast in the State, is declared to be a political party within the meaning of the primary law and may nominate all candidates provided for in this law. The State Executive Committee of any particular party may, by resolution, declare for the nomination of candidates for other than elective offices and also for the selection of national committeemen, delegates to the national political conventions, and for President and Vice President. Candidates are allowed to file sworn statements in support of their candidacy or in relation to the candidacy of other persons. The names of all candidates for the same office are printed on the ballot in alphabetical order. Provision is made for first and second choice in voting for candidates for nominations. Other measures passed at the 1913 session of the Legislature regulated campaign expenditures and provided penalties for corrupt practices in elections.

Local and Municipal Government.—The political unit of the State is the county. Five commissioners are elected for each county. Their term of office is two years. For each county, the officers are a clerk of the circuit court, a sheriff, constables, the county assessor of taxes, tax collector, treasurer, superintendent of public instruction, and a county surveyor. The Legislature has power to establish and abolish municipalities, to provide for their government, to prescribe their jurisdiction and powers, and to alter or amend the same at any time. Towns and cities have the privilege of establishing a commission form of government, and at the end of 1913 the cities of Orlando, Pensacola, St. Petersburg, Passagrille, Green Cove Springs, and Tampa had adopted this form of government. The board of county commissioners of each county, before Federal prohibition was enacted, once every two years, upon the application of one-fourth of the registered voters of any county, could call an election to decide whether the sale of intoxicating liquors should be prohibited. At the end of 1913, the cities of Gainesville, Lake City, Tallahassee, and Miami voted "no license." On that date, there were said to be only 355 saloons left in the State and these were located in villages and towns. There were no saloons in rural districts.

Other Constitutional and Statutory Provisions.—A homestead to an extent of 160 acres of land or half an acre within the limits of any incorporated city or town owned by the head of a family residing in the State, together with 1000 dollars' worth of personal property and the improvements on the real estate, is exempt from forced sale under process of any court. All property, real or personal, of a wife, owned by her before marriage or lawfully acquired by her afterward, is her separate property, and she is not liable for the debts of her husband. There are a pure-food law and laws for the suppression of contagious diseases in live stock.

The Florida Legislature of 1911 passed a measure providing that no verdict in the courts shall be set aside, or new trial granted, or judgment reversed, unless it shall affirmatively appear from the record that injustice has been done by the irregularity which was made the basis for assignment of error. A constitutional amendment ratified in 1924 prohibited the levy of State income or inheritance taxes.

History. Florida was discovered on Easter Sunday (*Pascua Florida*), 1513, by Ponce de Léon, who landed near the site of the present St. Augustine in search of the Fountain of Perpetual Youth. He failed to find the fountain and, returning in 1521, found death instead. Ayllon carried off large numbers of Indians from Florida as slaves between 1520 and 1526, and in 1528 Pánfilo Narváez (q.v.) invaded the country with a force of 400 men eager for conquest and booty. Narváez pushed into the wilderness north of the Gulf, and only four survivors of his band, among them Cabeza de Vaca, succeeded in reaching Mexico after infinite hardships. In 1539 Hernando de Soto (q.v.) traversed the country. In 1559 a well-equipped expedition of 1500 men under Don Tristan de Luna sailed from Vera Cruz and landed, August 14, on the shores of Santa Maria Bay, probably the Bay of Pensacola. The main body penetrated into the country for a distance of 40 days' march, while a smaller detachment explored the region as far as the Coosa River in eastern Alabama. Discouraged by the hardships encountered, the expedition returned to Mexico, after passing more than a year in the country.

Under the patronage of Coligny French Huguenots, led by Ribault, had founded in 1562 a colony at Port Royal in South Carolina; when that settlement, owing to the worthless character of the colonists, failed, René de Laudonnière brought over a new band of emigrants in 1564 and built Fort Caroline on the St. John's River. To uphold the Spanish claims to the country against the French, Pedro Menéndez de Avilés sailed from Spain in 1565, erected a fort at St. Augustine, and, taking Fort Caroline, exterminated the Huguenot colony. (See GOURGUES, DOMINIQUE DE.) St. Augustine was burned by Sir Francis Drake in 1586 and was plundered by English buccaneers in 1665; but the Spaniards retained their hold on the country and about 1699 founded Pensacola. In 1702 the Perdido River was made the boundary between Florida and French Louisiana. Between the Spaniards of St. Augustine and the southern English colonists hostile relations generally prevailed. A force from Carolina, under Colonel Daniel, burned St. Augustine in 1702, and in the following year Governor Moore, with a force of English and Creek Indians, defeated a Spanish force under Don Juan Mexia at Fort San Luis, near Tallahassee, and reduced a number of Spanish-Indian towns. In 1718 and again in 1719 Pensacola was taken by the French, the town being destroyed on the second occasion. When Georgia was settled, General Oglethorpe found it necessary to protect the new colony by an invasion of the enemy's country. He failed to take St. Augustine, but repelled an attack of the Spanish fleet on the forts of the Altamaha in 1742. By the Treaty of Paris in 1763 Spain ceded East and West Florida (the latter lay west of the Apalachicola River, and embraced a large part of what is now Alabama and Mississippi) to England, but recovered possession of both in 1783. West Florida was sold to France in 1795. After 1803 the United States asserted its title to the region between the Pearl River and the Perdido on the ground that it had formed part of Louisiana as held by France, Spain, and France again, in turn. In 1812 and 1813 United States troops took possession of the disputed territory. Pensacola was garrisoned by the British in 1814 with the consent of the Spanish authorities, but was taken by General Jackson in November of that year.

In East Florida Spain made no attempt to preserve order, and the country was overrun by white adventurers, Seminole Indians, and escaped slaves from the Southern States. Marauding bands of Indians and negroes crossed the frontier into Georgia, plundered and burned, and fled into Spanish territory beyond the reach of the United States authorities. Such reasons, as well as a natural hunger for land, made the Georgians anxious for the acquisition of the peninsula. In 1818 General Jackson, conducting operations against the Seminoles, invaded Florida and, after defeating the Indians, turned about and took Pensacola, the Governor of which had been supplying the Seminoles with arms. The town was restored to Spain; but in 1821 Florida, by virtue of a treaty concluded in 1819, passed to the United States, and in March, 1822, it was organized into a Territory. It was admitted into the Union in 1845. Between 1835 and 1843 a bitter warfare was waged against the Seminoles, and it resulted in the removal of the greater part of them beyond the Mississippi. On Jan. 10, 1861, the State passed an ordinance of secession. Three days previously the State authorities had seized Fort Marion and the arsenals at St. Augustine and Apalachicola; and on the 12th the navy yards and forts at Pensacola were taken possession of. Jacksonville, Fernandina, and St. Augustine were taken by the Federal forces in 1862; but at the battle of Olustee, Feb. 20, 1864, the State was lost to the Union. The ordinance of secession was repealed in October, 1865, and a State government was organized in 1866; but it was not till June, 1868, after a new constitution had been adopted and the Fourteenth Amendment ratified, that Florida was readmitted into the Union. For a number of years after the war the State was in difficult financial conditions, and the burden of taxation was heavy. Elaborate plans for the building of new railroads failed to be carried out, and many old roads went into bankruptcy. Between 1875 and 1880, a period during which the political power was passing from the Republicans to the Democrats, election contests were close and bitter, and appeals from the ballot box to the courts were frequent. The part played by the electoral vote of Florida in the disputed presidential election of 1876 was important. (See ELECTORAL COMMISSION.) After 1882 the reclamation of swamp lands in the south of the peninsula was carried on on a large scale and led to the development of the sugar industry. The discovery of rich phosphate deposits in 1889 improved economic conditions greatly, as has the growing popularity of the eastern coast as a winter resort.

On Dec. 23, 1907, Stephen R. Mallory, United States Senator, whose term expired March 4, 1909, died, and on December 26 Governor Broward appointed William James Bryan to fill the unexpired term. Mr. Bryan died on March 21, 1909, and William Hall Milton was appointed to serve until the election of his successor.

In the Democratic primary elections of 1908 Duncan U. Fletcher secured the nomination for the senatorship, and Albert W. Gilchrist was nominated for Governor. The prohibition issue figured in the election, and Mr. Gilchrist was the candidate for the local-option wing of the party. In the national election held on Nov. 3, 1908, Bryan received 31,104 votes; Taft, 9923; Debs, Socialist, 3747. For Governor, Gilchrist, Democrat, received 33,036 votes, and Cheney, Republican, 6453. The Legislature of 1909 passed a bill providing for the submission at the general election in November, 1910, of an amendment to the constitution providing for State-wide prohibition. The amendment failed of ratification by the electors. An attempt to amend the constitution, by the adoption of a suffrage amendment known as the Beard Disenfranchisement Resolution, designed to eliminate the negro vote, was defeated in the House of Representatives after it passed the Senate. The term of Senator Taliaferro expired on March 4, 1911, and primary elections for his successor were held on May 9, 1910. As none of the three contestants, Senator Taliaferro, N. B. Broward, and Claude L'Engle, received a majority of the votes, it was necessary under the Florida law as it then stood to hold a second primary on June 7, which resulted in the election of Mr.

Broward. The latter died, however, before he could take his place in the Senate. On this account, it was necessary to hold another primary election for Senator on Jan. 10, 1911. There were three candidates, W. A. Blount, John N. C. Stockton, and Nathan P. Bryan, but as no one received a majority, still another election was appointed for January 31. In this election, Mr. Bryan was successful. On April 17, 1911, an income-tax amendment to the constitution was ratified by the Lower House, but failed of passage in the Senate. Primary elections were held by the Democrats on April 30, 1912, for the nomination of State officers, a representative to Congress, and delegates to the National Convention. A majority of votes were cast for delegates favorable to Oscar W. Underwood for President. Park Trammell was elected Governor in 1912. The vote for President on Nov. 5, 1912, was as follows: Wilson, 36,416; Taft, 4279; Roosevelt, 4535; and Debs, 4806. Florida underwent a period of rapid land development in 1925, with some excess of speculation, followed by economic depression. The latter was increased by the devastation of two severe hurricanes, in September, 1926, and September, 1928. The popular vote of the State for President in 1928 broke political tradition by putting the State in the Republican column; Hoover received 144,168 votes, Smith 101,764; Doyle E. Carlton was elected Governor.

TERRITORIAL GOVERNORS

Andrew Jackson	1821–22
William P. Duval	1822–34
John H. Eaton	1834–36
Richard K. Call	1836–39
Robert R. Reid	1839–41
Richard K. Call	1841–44
John Branch	1844–45

STATE GOVERNORS

William D. Moseley	Whig	1845–49
Thomas Brown	"	1849–53
James E. Broome	Democrat	1853–57
Madison S. Perry	"	1857–61
John Milton	"	1861–65
William Marvin	Provisional	1865–66
David Shelby Walker	Democrat	1866–68
Harrison Reed	Republican	1868–72
Ossian B. Hart	"	1873–March, 1874
Marcellus L. Stearns	"	1874–77
George F. Drew	Democrat	1877–81
William D. Bloxham	"	1881–85
Edward A. Perry	"	1885–89
Francis P. Fleming	"	1889–93
Henry L. Mitchell	"	1893–97
William D. Bloxham	"	1897–1901
William S. Jennings	"	1901–05
Napoleon B. Broward	"	1905–09
Albert W. Gilchrist	"	1909–13
Park Trammell	"	1913–17
Sidney J. Catts	"	1917–21
Cary A. Hardee	"	1921–25
John W. Martin	"	1925–29
Doyle E. Carlton	"	1929–

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FLOR'IDA. The first of the Confederate privateering vessels, built at Liverpool by Laird, a member of Parliament. She sailed from Liverpool in March, 1862, under the name of the *Oreto;* was equipped at Nassau, Bahamas, with an armament of two seven-inch and six six-inch guns, and in September ran the blockade into Mobile Harbor. On Jan. 6, 1863, she ran out as the *Florida*. In the Brazilian port of Bahia, she was captured by the *Wachusett*, under Capt. Napoleon Collins (Oct. 7, 1864). Her seizure was a violation of the neutrality laws and gave rise to much excitement. The *Florida* was taken to Hampton Roads, where she was sunk not long after.

FLORIDA, CAPE. See CAPE FLORIDA.

FLORIDA, GULF OF. See FLORIDA STRAITS.

FLORIDA, UNIVERSITY OF. A State institution for the higher education of men at Gainesville, Fla. It was established in 1905, when all State institutions were merged by the Legislature of that year into the State University at Gainesville and the State College for Women at Tallahassee. The university is organized into the following departments: Graduate School; College of Arts and Sciences; College of Agriculture; College of Engineering; College of Law; Teachers College; Agricultural Experiment Station and University Extension Division. Each division is presided over by its own dean or director and is governed by dean and separate faculty and the major work of each division is carried on in its own separate and distinct building. There were 63 members of the faculty in 1914. The university has a total income of a little over $100,000 per year for current expenses. The enrollment in 1914 was 489, including the summer school with 348 in attendance during the regular session. The president elected in 1928 was J. S. Tigert, LL.D., former U. S. Commissioner of Education.

FLORIDA-BLANCA, flō-rē′dȧ blän′kȧ, JOSÉ MOÑINO Y REDONDO, COUNT OF (1728–1808). A Spanish statesman. He was born in Murcia, was educated for the law at Salamanca, and became the principal prosecuting official to the Council of Castile. In this capacity, he was the author of the decree for the expulsion of the Jesuits in 1767, and in 1772 he was sent by the Marquis Esquilache, the Prime Minister, on a mission to Rome to confer with Pope Clement XIV and was created Count of Florida-Blanca on his return to Spain. In 1777 he succeeded Grimaldi as Minister of Foreign Affairs and also became president of the Council of Ministers. Florida-Blanca's long ministerial career, lasting from 1777 to 1792, was one of the most brilliant and successful in Spanish history. In foreign affairs, his administration, although not so completely successful, was marked by true statesmanship. He is said by some writers to have suggested the famous "Armed Neutrality" (q.v.) in 1780, and it was during his administration of the Foreign Office that Spain joined with France, in accordance with the provisions of the Family Compact of 1761, in the war against England, though Florida-Blanca steadfastly opposed any recognition of American independence. A treaty was negotiated with the Sultan of Turkey, and Algiers bombarded, and the Algerine pirates were brought to terms. On the accession of Charles IV, in December, 1788, Florida-Blanca sought to retire from his position, but at the urgent request of the King retained his office three years longer, in which time the King rewarded him with the Order of the Golden Fleece. In 1792 an intrigue at court resulted in his retirement and the elevation of Aranda. Absurd and unsubstantiated charges of the malversation of funds were brought against him, and he was imprisoned for a short time in the fortress of Pamplona. On the fall of Aranda and the appointment of Godoy as Prime Minister, he was set at liberty, and restored to his rank and honors, after which he retired to his estates in Murcia. There he remained quietly until the Napoleonic invasion of 1808, when he was chosen President of the Central Junta of the government, but died soon afterward. His works have been edited with a good biographical introduction (dated 1867) by A. Ferrer del Río: *Obras originales del Conde de Floridablanca*, in the "Biblioteca de Autores Españoles," vol. lix.

FLORIDA JAY. See JAY.

FLORIDA REEFS or **KEYS.** See FLORIDA.

FLORIDA STRAITS (also called the New Bahama Channel, and the Gulf of Florida). The coast waters separating southeast Florida and the Florida Keys from the Bahamas and Cuba and traversed by the Gulf Stream (Map: United States, E., K 6). The total length of the straits is over 300 miles, and the width varies from 60 to 100 miles. The depth of the main channel varies from 3000 to 6000 feet, but the eastern half of the straits includes the shallow waters of the Great Bahama Bank.

FLORIDEÆ, flō-rĭd'ē-ē. The greatest group of Red Algæ, so nearly including all of them that it is used often for Red Algæ in general. See ALGÆ.

FLORIDIA, flō-rē'dē-ȧ. A city of Syracuse, Sicily, on the Ciani, 7 miles west of Syracuse, in a fertile country, with vineyards, olive groves, and fields of grain. Pop., 1901, 12,165; 1911, 12,522.

FLORIDSDORF, flō'rēdz-dôrf. A suburban municipality, 3 miles north of Vienna, the capital of a district of the same name (Map: Austria, C 4). It is an important industrial centre, has railway shops, locomotive works; manufactures sewing machines, vehicles, screws, chemicals, oleomargarine, parquetry work, twine, bagging, rubber goods, and pottery. It also has large breweries and distilleries. Floridsdorf was a town of 6000 inhabitants prior to 1896, when it was made the government seat of a district and its municipal area extended to embrace several adjacent villages. Pop., 1900, 36,599; 1910, 38,727.

FLORIG'RAPHY. See FLOWERS, LANGUAGE OF.

FLORIKIN. See FLORICAN.

FLOR'IN (OF., Fr. *florin*, from It. *fiorino*, from *fiore*, Lat. *flos*, flower; associated by popular etymology with It. *Fiorenza*, Florence, from Lat. *florere*, to bloom, from *flos*, flower). The name of a gold coin first struck in Florence (q.v.) in the thirteenth century. It was of the size of a ducat and had on the obverse a lily and on the reverse the head of St. John the Baptist. These coins were soon imitated all over Europe. It was out of them that the German gold guldens of the Middle Ages and the modern silver guldens arose. These last were to the end marked by the letters *Fl.* The gulden, or florin, was once the unit of account in Austria, and the name is given to a silver two-kronen piece having a value of $0.4052. Till 1875 a florin, or gulden, of $0.35 was the unit in the South German states. The Dutch florin, or guilder, is also a silver piece and is worth $0.4019. The English two-shilling piece, called a florin, is worth $0.4866.

FLORIN'DA. In the legendary account of the conquest of Spain by the Arabs, the daughter of Count Julian, Governor of Andalusia, seduced by Roderic, last of the Gothic kings of Spain. In revenge her father invited the Saracens into Spain and brought about the fall of the Visigothic Kingdom (711).

FLORIN'IANS. A Gnostic sect, of the second century, so called from a Roman presbyter, Florinus, who introduced doctrines resembling those of the Valentinians (q.v.) into Rome in the latter part of the second century. See GNOSTICS.

FLORIO, JOHN (?1553–1625). An English author, son of a Florentine Protestant, who fled to England. He taught Italian at Oxford and London, the Earl of Southampton (Shakespeare's friend) having been among his pupils. In 1603 he became reader in Italian to Queen Anne, and in 1604 he was appointed groom of the privy chamber. He passed the last five years of his life at Fulham and died in 1625. He is author of *First Fruits which yield Familiar Speech, Merry Proverbs, Witty Sentences, and Golden Sayings* (1578); the well-known Italian-English dictionary, *A World of Words* (1598); and an excellent translation of Montaigne's essays (1603), often reprinted.

FLORIS, flō'rēs, FRANS (properly De Vriendt) (c.1517–70). A Flemish painter of the Renaissance. He was born in Antwerp. The son of a stonecutter, he first studied sculpture, then took up painting under Lambert Lombard at Liége. Probably directed by that master, he went to Rome and studied the works of Michelangelo and Raphael. Returning to Antwerp in 1540, he opened a school, which is said to have furnished instruction to 120 pupils. He enjoyed the patronage of William of Orange and Counts Egmond and Horn, adorned the houses of many Spanish nobles and Antwerp dignitaries, and was in charge of the decorations for the reception of Philip II in 1549 and 1556. Among his most characteristic pictures are "The Last Judgment," in the Brussels Museum; "Lot and his Daughters," in the Dresden Gallery; and "The Fall of the Rebellious Angels" in the Antwerp Museum. His admiration and study of Michelangelo are plainly to be seen in the complicated attitudes of his figures, which are boldly conceived; but taken as a whole, his works are artificial and mannered. The most important of his portraits, which are better than his other subjects, is "The Falconer" (Museum of Brunswick).

FLORIS'SANT BEDS. A small group of sedimentary rocks in the South Park, Colorado, at Florissant, famous for its early Tertiary fossils. The beds occupy the site of a fresh-water lake that during Eocene or Oligocene time was filled by a deposit of fine volcanic ash, now consolidated into thin papery shales. Within them have been found the remains of plants, fishes, and insects in great profusion and variety; over 700 species of insects from the locality have been described by Scudder in the reports of the United States Geological Survey.

FLORIS'TICS (from Lat. *flos*, flower). The division of phytogeography which treats of plant distribution from the standpoint of classification (taxonomy) rather than from the standpoint of environment (ecology). See Distribution of Plants; Ecology; Taxonomy.

FLOR'IZEL. The Prince of Bohemia, in Shakespeare's *Winter's Tale.*

FLORIZEL, or FLORISEL, DE NIQUEA. A supplement by Feliciano de Silva to the mediæval romance *Amadis of Gaul.*

FLORIZEL AND PER'DITA. The name given by Garrick to his revision for the stage of Shakespeare's *Winter's Tale*, which was produced Jan. 21, 1756, at the Drury Lane.

FLO'RUS. A Roman historian, who flourished in the reign of Trajan or Hadrian. He is generally, on manuscript authority, called L. Annæus Florus. Of his life we know very little. He wrote an epitome of Roman history (*Epitomæ de Tito Livio Bellorum Libri Duo*) from the foundation of the city to the time of Augustus. This work, which is still extant, is intelligently composed, but at times inaccurate and partial. It is based, as its title shows, on the history of Livy. The best editions are by Halm (Leipzig, 1879) and Rossbach (ib., 1896). Consult Teuffel, *Geschichte der römischen Literatur*, vol. iii (6th ed., ib., 1913).

FLOSS SILK (from OF. *flosche*, It. *floscia*, floss, from Lat. *fluxus*, soft, flaccid, from *fluere*, to flow). Silk fibre from the finest part of the cocoon, after all that can be reeled off has been removed. It is carded and spun, but not twisted, so that its texture is soft, downy, and lustrous. It is used chiefly for embroidery. See Silk.

FLOTATION. See Hydrostatics.

FLOTE. See Flotte.

FLOTOW, flō'tō, Friedrich von (1812–83). A German composer of light opera. He was born at Teutendorf, Mecklenburg, the son of a minor landed nobleman. He was at first educated for the diplomatic service, but early decided to devote himself entirely to music. A period of study in composition under Reicha, at Paris, was brought to a termination by the revolution of July, 1830; whereupon he returned to Mecklenburg and devoted himself to composition. He was unfortunate with his earlier operas, which were refused by the managers of the important Paris theatres; but his success was compensatingly great upon the production of *Le naufrage de la Méduse*, in 1839, at the Théâtre de la Renaissance. *Le forestier*, *L'Esclave de Camoëns*, *L'Ame en peine*, *Indra*, and *L'Ombre* were among his successful operas, but only two are still in the modern repertoire, *Alessandro Stradella* and *Martha*. His operas were characterized by easy and lively dramatic action, readiness of invention, facility of expression, pleasing melodies, and graceful instrumentation. In 1856 he received the appointment of intendant of the court theatre at Schwerin and was elected a member of the French Institute in 1864. He died at Darmstadt.

FLOT'SAM. Goods which are cast overboard for the safety of the ship or in case of wreck and which are afterward found afloat. The term "wreck" is, in legal acceptation, confined to a vessel or cargo or any part thereof which is cast ashore. From wreck are distinguished those goods known to the common law as *flotsam*, *jetsam*, and *ligan*. The first is the term applied where the goods continue floating on the surface of the waves; the second where, being cast into the sea, they sink and remain under water; the third where they are sunk in the sea, but are tied to a cork, bladder, or buoy, in order that they may be recovered.

By the common law wreckage proper became the property of the crown, immediately if no evidence of ownership came ashore with the wreck, otherwise if unclaimed for a year and a day. But of flotsam, jetsam, and ligan there was no forfeiture to the crown except upon the failure of the owner to present himself and claim his property. The disposition of such goods, whether belonging to the category of wreck or of flotsam, etc., is now regulated by statute both in England and the United States, it being usually provided that the local authorities where such goods are found or where they are brought by the finder shall have the custody of them for the owner. See Wreck; also Admiralty Law; Salvage; Derelict.

FLOTTE, flōt, or **FLOTE,** Pierre (c.1250–1302). Chancellor of France, Minister of Philip the Fair, born in Auvergne. He was sent on important missions by the King in 1293 and was at court in 1296. About two years afterward he was sent to Rome for the canonization of Louis IX, and in 1299 he went to England as Ambassador. He was in the thick of the quarrels between Philip the Fair and the Pope and was the first layman to be Chancellor of France. He was killed at Courtrai.

FLOUN'DER (Ger. *Flunder*, from ODan. *flundra*, OSwed. *flundræ*, flounder). A name for any of the many marine fishes of the family Pleuronectidæ (see Flatfish), which includes the halibut, dab, plaice, fluke, etc. The body is more or less elongate, always much compressed, and with the dorsal and anal fins extending for the greater length of the body; the scales may be absent. The flounders possess the remarkable character (unique among vertebrates) of swimming, not with the back, but with one side uppermost. The peculiarly twisted structure of the head is adapted to this mode of life, both eyes being on the same side of the head. When young, the eyes, as in other fishes, are on each side of the head, and they swim erect; but as the fish grows older, one eye moves to the other side, either around the edge or right through the head. The side of the body which is uppermost is normally colored, the particular coloration usually corresponding strongly to the color of the bottom on which it dwells, while the side which habitually lies downward is white or faintly colored. Flounders abound chiefly where the bottom is smooth, either sandy or muddy. The family is a very large one, including about 55 genera and 500 species. They are found in all oceans, some of them living in brackish waters and even entering rivers. Some of the species grow to an enormous size—500 pounds. They are very important food fishes. (See Fisheries.) The family is divided into three tribes, viz.: (1) Hippoglossinæ, the halibuts, having a large, symmetrical mouth and the ventral fins symmetrical (see Halibut); (2) Pleuronectinæ, the flounders proper, with a smaller, unsymmetrical mouth and the ventral fins symmetrical or almost so; and (3) Psettinæ, the turbots (q.v.), having a large mouth and the ventral fins unsymmetrical.

The most important species of the coast of the Northern States is the summer flounder (*Paralichthys dentatus*), also called plaice, or deep-sea flounder, which may reach a length of 3 feet and a weight of 15 pounds, but usually is much smaller. Like the others, it is carnivorous, feeding on shrimps, crabs, small fish (which it often pursues rapidly at the surface), and even on carrion. It is most abundant on the shallow, sandy bottoms around Long Island, N. Y., where it is taken between May and October in vast quantities. Another very similar species replaces this on the southern coast, and still another in the Gulf of Mexico. The four-spotted flounder (*Paralichthys oblongus*), which has four oblong blackish spots, frequently comes to market. The "common," or winter, flounder (*Pseudopleuronectes americanus*) is also valuable as a food fish. The best-known species of the Pacific coast is the diamond flounder (*Hysopsetta guttulata*), brown blotched with bluish, and constantly caught for market. Several species are among the food fishes of Alaskan waters, even along its Arctic coast. The pole flounder is a species (*Glyptocephalus cynoglossus*) of a group known as "flukes," and in England, where it is common and highly prized, it is called "craig fluke."

Consult Goode, *Fishery Industries*, sec. i (Washington, 1884), and Jordan, *Fishes* (New York, 1907). See *Factors of Organic Evolution* in the article EVOLUTION. See Plate of FLATFISH AND FLOUNDERS.

FLOUR (formerly a variant of *flower*, q.v., for etymology) and **FLOUR MILLING**. Flour is the ground and bolted substance of wheat (*Triticum vulgare*). The name is also applied to other grains when ground, as rye flour, buckwheat flour; but if the grain from which the flour is made is not specified, the unqualified term, both in common and commercial usage, means wheat flour. The comparative importance of its production is shown from the fact that, of the total cereal products milled in the United States in 1909, 57.7 per cent were from wheat. Corn meal, of which 28 per cent of the total product consisted, ranked next, the remaining 17.3 per cent being divided among the other cereals. That the use of wheat flour to the exclusion of all the other grains is not due to the higher nutritive value of wheat is shown from the accompanying table:

COMPOSITION OF FLOURS (CHURCH)

KIND OF FLOUR	Moisture		Ash		Proteins (6.25 N)		Fibre		Ether Extract (Fats, etc.)		Nitrogen-free extract	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Wheat	15.	9.0	0.8	0.3	15.0	8.0	1.0	0.1	2.0	0.5	90.	82.
Rye	14.	12.0	1.5	0.5	11.0	6.0	0.6	0.4	1.0	0.9	92.	88.
Barley	15.	10.0	2.0	1.0	12.0	8.5	0.6	0.3	2.0	0.5	92.	87.
Buckwheat	18.	12.5	1.5	0.8	9.5	5.0	0.6	0.3	2.0	0.8	93.	84.
Rice	15	10.0	0.6	0.3	10.0	7.0	0.4	0.1	0.6	0.3	90.	85.
Oat (meal)	10.	6.0	2.4	2.0	18.0	14.0	1.4	0.7	9.5	6.5	76.	72.
Maize (meal)	18.	8.0	4.5	1.0	11.5	8.0	3.5	0.7	6.0	2.5	80.	63.
Graham	15.	11.0	2.2	1.8	15.0	10.0	2.4	2.0	2.2	1.9	72.	70.

The very extended use of wheat flour for bread is due to the presence in the kernel of gluten, a highly tenacious body, which is not present in the same form in other cereal flours. Gluten is made up chiefly of two proteins, glutenin and gliadin, the quality depending on the proportion of each. In general soft wheat flours contain 68 to 78 of the total nitrogen in the form of gliadin, and hard wheat flours, 65 per cent or less. In flour of the highest bread-making properties glutenin and gliadin are present in such proportions that they form a well-balanced gluten. From available data it would appear that the proper proportion for the gluten of hard wheat flour is 65 per cent gliadin to 35 per cent glutenin. Occasionally the percentage of gliadin may fall as low as 55 per cent. Any great variation from the ratio mentioned has a marked influence upon the character of the bread. Advantage is taken of this fact in milling when wheats of opposite type, one with high and the other with low gliadin content, are mixed before grinding in order to improve the quality of the flour. The adhesive or sticky quality of wheat flour enables it to retain the carbonic-acid gas formed by the agency of yeast or baking powder and thus produces "lightness" in the bread. For the same reason other flours are used most successfully when combined with wheat flour. The other flours are rarely used alone for bread, except rye flour, from which the "black bread" of Germany and northern Europe is made. The rye bread usually sold in the United States is prepared from a mixture of rye and wheaten flour. In the southern United States corn bread is often made without the addition of wheat flour.

Historical Development of Milling Processes. Long before the dawn of history cereals formed an important article of food for the human race. At first these grains were used in the crude state, without grinding or cooking. But agriculture was one of the earliest arts of civilization to be developed, and the cereals among the first of the agricultural products to receive cultivation. It must have been discovered very early that, both from the standpoint of mastication and flavor, grain is much improved by grinding, so that the first milling processes came soon after the cultivation of the soil. The earliest history we have regarding the grinding of wheat or corn dates back over 6000 years in the early days of the Egyptian peoples. At first a mere breaking up into coarse fragments by means of a mortar and pestle, or substitute, was all that was attempted. The second step in the development of milling processes was taken when for the mortar and pestle were substituted two roughened grinding surfaces, placed close together, between which the grain was reduced to powder. This use of the upper and nether millstone for grinding grain also dates back to prehistoric times. An improvement over this simple device is the *quern*, or hand mill, still used among semicivilized peoples. The use of animal and then of water power by the Greeks (450–400 B.C.) and Romans (350–300 B.C.) to turn the millstones came much later. About 400 years after the Romans invented the vertical water-wheel mill drive, they made the ship mill, which floated and was operated by a flowing stream or tide. The windmill was first seen in 600 A.D. At first the arms of the mill revolved on a tripod stand, but later a turret or tower displaced it, and from the latter the old picturesque mill evolved. The first successful steam flour mill was erected in London in 1784. The use of millstones for grinding flour was universal until the close of the eighteenth century, and is still so common, especially in small "customs" mills—mills which grind for a stipulated sum (fee) or instead take a part of the grain which is brought to the mill for grinding—that a brief description of this process of milling is given. The millstones are made of buhrstone, a form of silica as hard as flint but not so brittle. The best buhrstones are said to come from France. They are usually from 4 to 6 feet in diameter, and each consists of a number of pieces strongly cemented and bound together with iron hoops. The grinding surface of each stone is furrowed or grooved, one side of each groove being cut perpendicularly and the other side being inclined to the surface of the stone.

Fig. 1 shows a section of a flour mill of the old type. The millstones are at *a*, the lower of which is firmly fixed, and the upper is made to revolve. Motion is communicated by the spur wheel *b*. The grain, previously cleaned, is fed to the millstones by means of the hopper, *c*, connected with which there is a valve, *d*, for regulating the supply. The millstones are, of course, inclosed, and the flour passes down through the spout, *e*, to the worm conveyer at *f*, which carries it along to elevators, *g*. These raise it up to the floor, on which the dressing machine, *h*, is placed. Hoppers, *i*, are placed below the dressing machine, by means of which the flour and bran are filled into sacks.

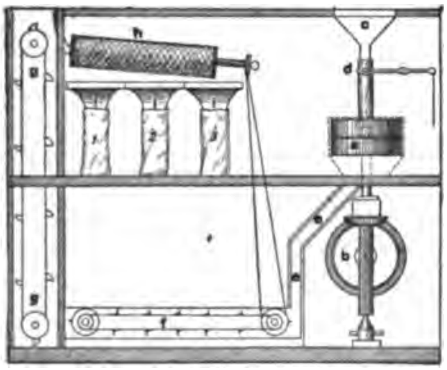


FIG. 1. OLDER FORM OF FLOUR MILL.

The third and final step in the development of milling processes was taken when rollers were substituted for stones to perform the grinding process. Iron rollers were generally used at Pest to grind wheat before 1840 and, under the name of the Hungarian system, rapidly spread throughout Europe. As early as 1810 Ignes Paur, of Austria, invented a middlings—the mealy part (endosperm) of the grain more or less free from bran and germ, the coarser part of the meal is termed semolina—purifier which is described below. It is claimed that in 1868–70 E. N. LaCroix, a French miller, independently invented a system of roller milling similar to the Hungarian system and installed it in one of the great flour mills of Minneapolis. Its introduction marked an epoch in the production of flour. The essence of this new process is the substitution for a single grinding between millstones of a succession of grindings between several sets of iron or porcelain rollers. As a musty odor and dark color are given to flour if it is heated during the process of manufacture, the rollers are kept cool.

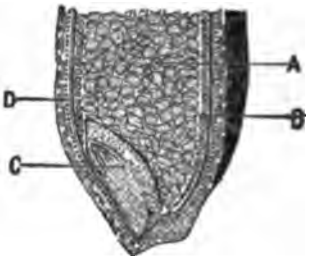


FIG. 2. MAGNIFIED SECTION OF GRAIN OF WHEAT.

The endosperm, *A*, which occupies the central and larger portion of the wheat kernel, is the chief storehouse of starch. It is made up of cells in which small starch grains are held in a network of gluten. At the lower end of the grain is the germinal portion, *C*, containing the embryo and scutellum. The germ, in addition to carbohydrates and nitrogenous matter, contains a large proportion of fat.

The wheat kernel is surrounded by five layers which make up the bran; viz., the epidermis, epicarpium, endocarpium, testa, and episperm. The three outermost layers are called the skin

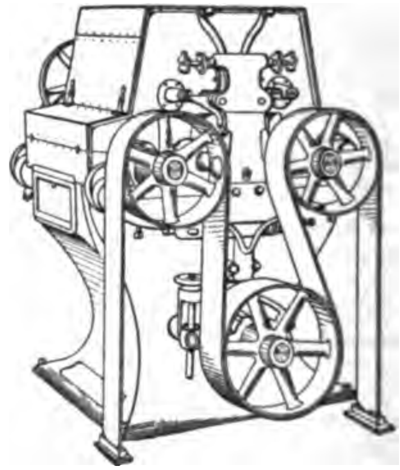
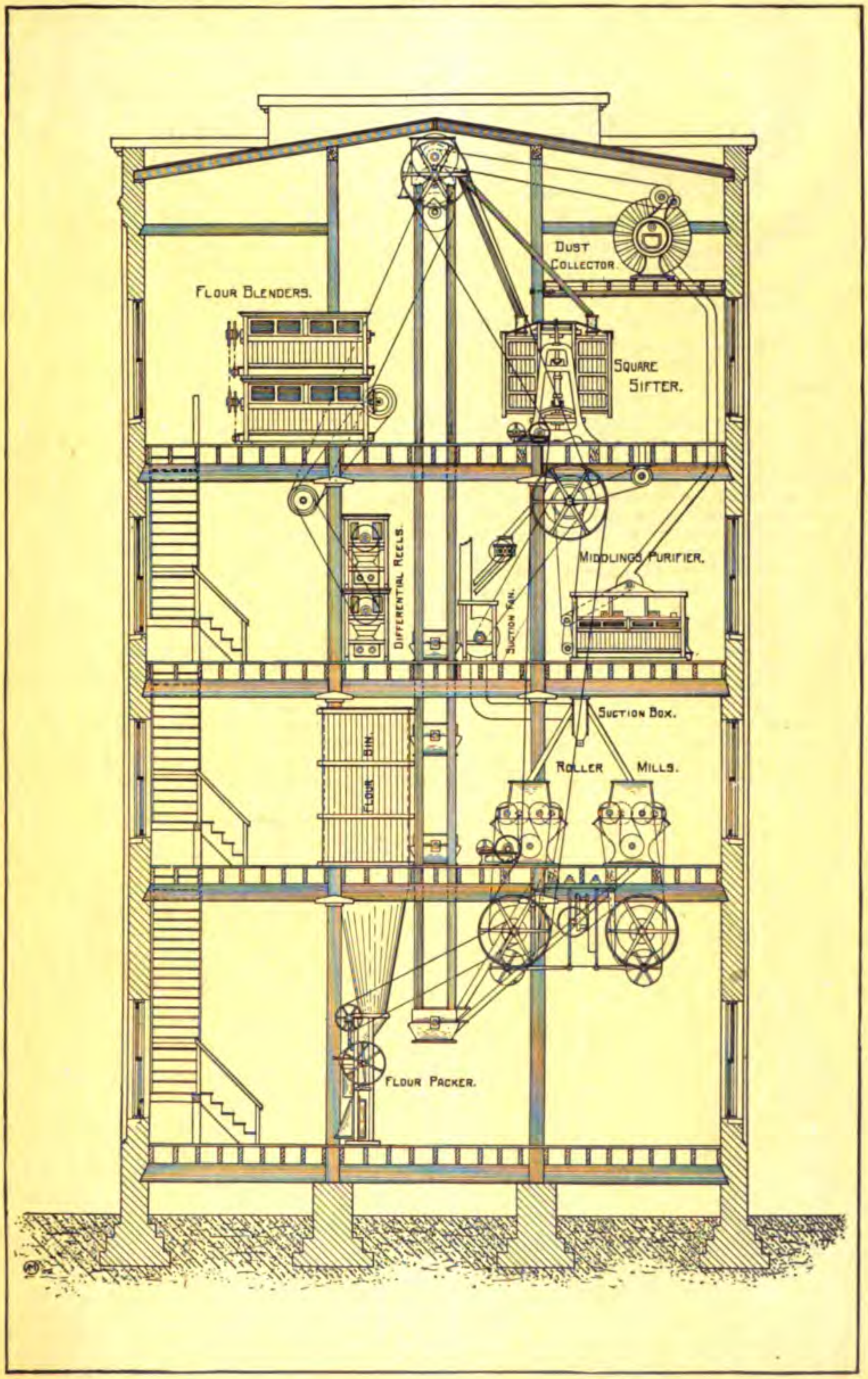


FIG. 3. A MODERN DOUBLE ROLLER MILL.

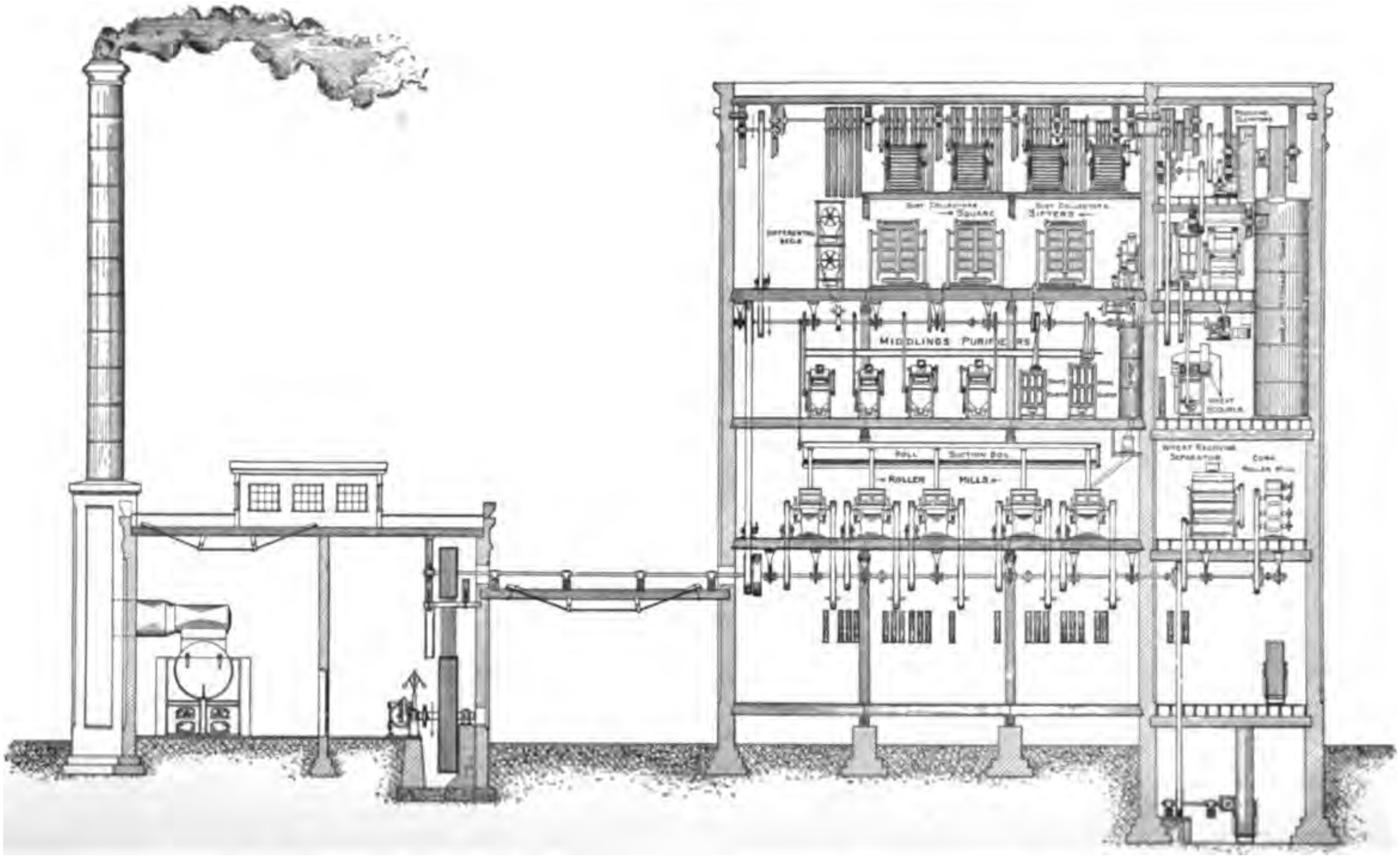
Between the innermost of the bran layers and the flour cells (endosperm) lies the cereal or aleurone layer, *B*, which consists of rectangular cells filled with a nitrogenous substance called cerealin or aleurone and has a high food value. The fine layers of the bran *D* contain a high percentage of cellulose, which at one time was

FLOUR



END SECTION OF A MODERN AMERICAN FLOUR MILL

(From Plans furnished by the Nordyke and Marmon Company, Indianapolis, Ind.)



SIDE SECTION OF A MODERN AMERICAN FLOUR MILL
(From Plans furnished by the Nordyke and Marmon Company, Indianapolis, Ind.)

thought to be entirely indigestible. Some phosphates and other mineral matters are found in all parts of the wheat berry, the amounts being especially high in the bran. Bran also contains an organic phosphorus compound called phytin. This substance in conjunction with the inorganic phosphates is thought to have a stimulating effect on loaf volumes and is said to produce a bread of better texture and color. The coloring matter of flour, carrotene, is closely related chemically to lutein, or lipochrome. Certain enzymes or ferments, i.e., diastasic, proteolytic, catalytic, and oxidizing, are present in flour.

Two main grades of wheat are known to the miller: *winter* wheat, or that sowed in the fall and coming up in the early spring; and *spring* wheat, which grows during the summer and is harvested in the fall. The winter wheat, whose kernels are softer and more starchy, is more easily separated from the husk than the spring wheat, whose kernel is much harder and much richer in gluten. The harder or more flinty the wheat, the more difficult becomes the process of separating it from the husk.

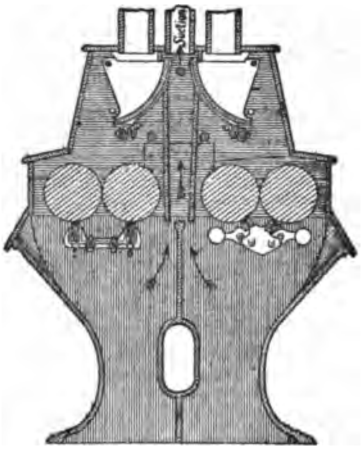


FIG. 4. SECTION OF A MODERN ROLLER MILLING MACHINE.

In modern milling the object is to obtain as much flour of good appearance and quality as possible and to diminish the yield of bran and shorts to a minimum. The wheat is thoroughly screened (dry cleaned) and scoured before milling. According to the brittleness of the wheat it is either dampened, soaked, or steamed—generally the latter—so that the bran may not split up into fine particles and contaminate the flour. Sometimes after a wet, cool harvest it is necessary to dry some of the grain in order to obtain a uniform degree of hardness, toughness, and mellowness. This is necessary because it insures each individual grain almost the same degree of breaking down in the reduction process. Each step in the reduction process of milling, i.e., each passage through a pair of rollers, is called a break. The first break flattens some of the softer kernels, splitting them into longitudinal grooves, and produces a small amount of flour known as first break flour, and middlings, known as first middlings, which are then passed on to other rolls for reduction. The number of streams of flour depends upon the system employed. At the present day the four break systems are in the majority. The modern milling system, instead of pulverizing or reducing the grain into a variable mass of skins, endosperm, and other vegetable tissues, as hairs and débris, operates stepwise, breaking the kernel or berry slowly and at each operation sifting away and purifying any of the freed particles of the endosperm before dispatching the ruptured grains to the next rollers for further treatment. The middlings, tailings, and chops are passed on from roller to roller until all the fine flour particles are reduced, removed, and purified. Each break effects a mechanical separation of the chop into break flour, middlings flour, and tailings, and this process is repeated until finally the flour stock is practically all removed from the offals, as the wheat by-products not suitable for human food are called.

The different streams of break flour and middlings flour are blended so as to form either standard grades or special commercial brands of flour, and usually wheats of different quality are mixed before grinding so that a flour of definite characteristics may be produced. The standard grades are: First Patent, Second Patent, Straight Grade, First Clear, Second Clear, and Red Dog. Standard patent flour, which is the bread flour most commonly found on the market, includes the first and second patent grades and the first clear or bakers' grade of flour.

In flour making the germ is commonly removed because it contains a considerable amount of fat which readily becomes rancid and injures the quality of the flour if the germ is retained in it. In modern milling over 70 per cent of the wheat is recovered as standard patent flour, about 1 per cent as low-grade flour, about 2 per cent as Red Dog flour, and the remainder as shorts or bran. Up to 1908 most of the higher and other grades of flours of the United States were bleached with nitrogen peroxide. The United States Secretary of Agriculture, J. Wilson, ruled (Decision 100) that the use of such flours was detrimental to health. Moore and Wilson in a more recent investigation showed that bleaching by this agent is not a more rapid achievement of a slowly occurring natural process.

Besides the flours enumerated above, Graham flour and whole-wheat or entire-wheat flour are commonly found in market. The Graham flour is unbolted wheat meal ground from the whole kernel. There are on the market many imitation Graham flours made by mixing inferior grades of flour with bran. The old method of making Graham flour, i.e., by grinding the whole wheat berry on stones or rolls, is still in use in many of the mills. The so-called whole-wheat or entire-wheat flour contains all of the kernel except a portion of the bran. The patent and clear grade flours contain the endosperm and very little of the bran, germ, and embryo.

The Graham and entire-wheat flours are somewhat superior to patent flour as regards composition, but extended experiments have shown that they are inferior as regards percentage of digestibility. The coarse flours are useful in the diet, as they tend to counteract constipation. Flours of all sorts are very thoroughly digested and are extremely valuable and economical foods. The use of different sorts is a convenient way of adding to the variety of the diet. See also BREAD; WHEAT.

Gluten flours, from which the starch has been almost entirely excluded, have also been manufactured and are valuable in certain forms of dyspepsia, where there is an inability to digest carbohydrates, and particularly in the diet of those suffering from diabetes mellitus. Many flours sold as diabetic or gluten flours to-day can hardly with justice to the invalid be used for the purpose for which they are intended.

Self-Raising Flour. This is simply a flour into which has been mixed some chemical leavening agent, such as an ordinary baking powder, or its constituents. This is possible, because bicarbonate of soda and tartaric acid, e.g., do not combine to produce carbonic-acid gas except in the presence of water. Self-raising flour is similar to other flour in composition, save for the higher ash content due to the baking powder added. It is used to a considerable extent in domestic cookery. See Bread.

Quality of Flour. It is very important for millers and bakers to know the quality of flour, and various methods have been proposed for ascertaining it. While the general characteristics of the wheat, e.g., the weight per barrel, size of the granules, color, plumpness, absence of blemishes, etc., all affect the flour and can be observed by inspection, the commercial value of the flour itself can best be learned by studying a number of its qualities.

The appearance, quality, amount, and character of the bread obtained from a given quantity, and similar factors are important in judging of the quality. It has been found that a study of the various chemical properties furnishes a means of judging of the quality, and the chemist who examines flour takes into account especially the moisture content, acidity, amount and proportion of different nitrogenous constituents (proteins), capacity to absorb water, degree of granulation, color, fat content, and the power of expansion and tenacity of the gluten.

The range of absorption of water in different kinds of flour is considerable and is of much importance, as it greatly influences the number of loaves which may be produced from a barrel of flour. In general, flours with a high gluten content have the greatest capacity for absorbing water, the absorption number ranging from 60 to 66, while flours with a low gluten content absorb less water, the absorption number ranging from 55 to 59. The actual and most reasonable test of flour is the kind of bread it will make. All well-conducted mills have experimental bakeries wherein their product is tested.

Flour Manufacture in the United States. In Colonial days large quantities of wheat were raised and converted into flour in America; but with the Hessian soldiers of the Revolution was imported the Hessian fly, a scourge which literally drove the production of wheat across the Alleghanies. Since that time the centre of wheat and flour production has steadily moved to the Northwest. In 1815 a steam flour mill, having a capacity of 700 barrels per week, was built at Cincinnati. The first merchant mill in Minneapolis was erected in 1854. During the last half century the importance of the latter city as a milling centre has increased so rapidly that it now ranks first in the world as a producer of flour. With the new process of flour manufacture came the era of the big flour mill. This was due partly to the fact that the machinery involved is too complicated and expensive for the small manufacturer and partly because this change is simply in line with modern industrial development. In the report on flouring and gristmill products of the United States census of 1910 (statistics of 1909) a distinction is made between merchant and customs mills, and from the statistics given it is evident that milling on a small scale is still a flourishing industry. Customs mills are defined in this report as mills grinding wheat, corn, and other grain furnished from farms in the neighborhood and are usually denominated *gristmills*. Merchant mills are large manufacturing establishments supplying the home market and exporting flour to the principal foreign countries. In mere numbers the customs or exchange mills constitute 50.5 per cent of the total number of milling establishments. The largest number of small mills was found in Pennsylvania, and of mills of the greatest capacity in Minnesota. The total number of merchant flour mills grinding wheat was 7342, of which 1721 belong to the class producing less than 1000 barrels per annum. The growth of the milling industry in general during the last half century is shown by the following statistics: In 1850 there were 11,891 establishments in the United States engaged in milling cereal products; in 1909 there were 123,652 such establishments. In 1850 the capital thus invested amounted to $54,415,581, and the value of the annual product to $136,056,736; in 1909 the capital invested amounted to $370,410,289, and the annual product to $938,699,953, of which $883,984,000 was the product of flouring mills. The share of the wheat which is exported from the United States in the form of flour ranges from 30 to 70 per cent. In years of large exports the share which is turned into flour before exportation is from 25 to 35 per cent, but in years of small exportation the share ranges from 60 to 75 per cent.

Bibliography. *One Hundred Years of American Commerce* (New York, 1895); *United States Census for 1910*, vol. x, "Manufactures," p. 405; *United States Census for 1880*, vol. iii; *Bulletin 13*, part ix of *Bureau of Chemistry, United States Department of Agriculture; Bulletins 85, 101, 126, 143*, and *156* of the *United States Department of Agriculture, Office of Experiment Stations; Farmers' Bulletins 112* and *249 of the United States Department of Agriculture;* Amos, *Processes of Flour Manufacture* (London, 1912); White, "Influence of Bran Extract on the Baking Quality of Flours," *Bulletin 106* (North Dakota Station); Le Clerc and Jacobs, "Graham Flour: A Study of the Physical and Chemical Differences between Graham Flour and Imitation Graham Flours," *Bulletin 164, Bureau of Chemistry, United States Department of Agriculture;* Kosutany, *Der ungarische Weizen und das ungarische Mehl* (Budapest, 1907); Allen, *Commercial Organic Analysis*, ed. by Leffmann and Davis, vol. i, 4th rev. ed. (Philadelphia, 1909); Street, "Diabetic Foods Offered for Sale in the United States," *Journal of American Medical Association*, vol. lx, No. 26 (Chicago, 1913); Moore and Wilson, "The Effects of Nitrogen Peroxide on the Constituents of Flour in Relation to the Commercial Practice of Bleaching Flour with that Reagent," *Journal of Hygiene*, vol. xiii, No. 4 (Cambridge, 1914).

FLOUR BEETLE, or Weevil. Any of several species of minute, flattened, reddish tenebrionid beetles infesting flour, meal, and all sorts of stored manufactured cereals. They may do great damage in warehouses and mills, the annual loss in the United States from this cause amounting to $100,000 or more, and constantly increasing. Our most common species are *Tri-*

bolium confusum and *Tribolium ferrugineum*, which lay their eggs in cracks of barrels, etc., which hatch speedily into minute larvæ that feed upon the flour and then transform into pupæ. These develop into adults so rapidly that in favorable warm places several broods a year may arise. The beetles often bore holes into the wood. Nothing short of thorough scalding will efface them, but painted receptacles aid in keeping them out. The larvæ of larger beetles of similar habits are called meal worms (q.v.).

FLOURENS, flōō'räɴ', GUSTAVE (1838–71). A French politician and author, born in Paris, son of the physiologist, Marie Jean Pierre Flourens. In 1863 he became deputy professor of natural history at the Collège de France, where his liberal views, particularly about the multiple origin of the human race, roused the opposition of the clergy, who forced his resignation. He went to Belgium and later to the East, took an important part in the Cretan insurrection (1866), and was elected to the National Assembly of Crete, which he also represented at Athens. After his return to France in 1868, his attacks on the Empire caused his arrest (April, 1869), and upon his release from a three months' imprisonment he was wounded in a duel with the Bonapartist Paul Granier de Cassagnac (q.v.). For an attempt at armed resistance on the occasion of the arrest of Henri Rochefort (q.v.) in 1870, he was sentenced to imprisonment for three years. He escaped, however, to England, whence he returned to become a Communist leader during the siege of Paris. Upon the proclamation of the Commune (March 18, 1871), which he had been one of the first to urge, he was elected a member and appointed colonel. He was killed during the march on Versailles. He published *Histoire de l'homme* (1863), his first lectures, and *Science de l'homme* (1865). Consult *Gustave Flourens et l'insurrection crétoise de 1866–68* (Paris, 1893), and C. Prolès, *Les hommes de la révolution de 1871* (ib., 1898).

FLOURENS, LÉOPOLD EMILE (1841–). A French politician, born in Paris, a brother of Gustave Flourens. He was auditor of the Imperial Council from 1863 to 1868 and in 1879 was appointed head of a department in the Ministry of Education, in which capacity he took part in all anticlerical ordinances. In March, 1885, he became President of the departments of Legislation, Justice, and Foreign Affairs in the Council of State, and President of the Deliberative Commission on French protectorates in the Ministry of Foreign Affairs. In 1886 he became Minister of Foreign Affairs in the Goblet cabinet, and succeeded in adjusting peaceably the Schnaebelé affair (April, 1887). Flourens retained his portfolio during the Rouvier and Tirard cabinets until April, 1888. In 1888 he was elected to the Chamber of Deputies, where he acted with the moderate Republicans, was reëlected in 1889 and 1893, defeated in 1898, and was again successful in 1902. He published *Organisation judiciaire et administrative de la France et de la Belgique de 1814 à 1875* (1875), for which a prize was awarded by the Academy, and *Alexandre III: sa vie, son œuvre* (1893).

FLOURENS, MARIE JEAN PIERRE (1794–1867). A celebrated French experimental physiologist and author, born at Maureilhan, Hérault. After having obtained his degree of M.D. at Montpellier, at the age of 19, he proceeded to Paris. He was assistant to Cuvier in 1828–30, and in 1832 he succeeded him as professor of natural history in the Jardin du Roi. In 1833 he succeeded Dulong as perpetual secretary of the Academy of Sciences, in 1835 he became professor in the Collège de France, and in 1840 the French Academy elected him a member. He was made a peer of France by Louis Philippe in 1846. He died at Montgeron, near Paris. For more than 40 years Flourens was a voluminous writer on human and comparative anatomy and physiology, on natural history, and on various special departments of the history of the natural and physical sciences. Among his most important works are: *Recherches expérimentales sur les propriétés et les fonctions du système nerveux dans les animaux vertébrés* (1824), with a supplementary volume, entitled *Expériences sur le système nerveux* (1825); *Recherches sur le développement des os et des dents* (1845); *Anatomie générale de la peau et des membranes muqueuses* (1843); and his *Théorie expérimentale de la formation des os* (1847), perhaps the most celebrated of his works. Among his smaller and popular works are his *De l'instinct et de l'intelligence des animaux* (1841); *Histoire de la découverte de la circulation du sang* (1854); *De la longévité humaine, et de la quantité de vie sur le globe* (1854); *Eloges historiques* (3 vols., 1856–62).

FLOWER (OF. *flor, flur, flour, fleur*, Fr. *fleur*, from Lat. *flos*, flower, from *florere*, to bloom; connected with OHG. *bluoma*, Ger. *Blume*, Goth. *blōma*, Icel. *blōme*, Eng. *bloom*, Ir. *blāth*, flower, and ultimately with Lat. *folium*, Gk. *φύλλον*, *phyllon*, leaf). A structure developed by the higher plants only, and chiefly concerned in the production of seeds. An exact definition of a flower is very difficult, but the popular conception is clear enough for this presentation. Not all plants which produce seeds can be said to have true flowers, since the conifers and their allies no more possess true flowers than do many of the fern plants.

Parts of Flower. The parts of an ordinary flower may be illustrated by the buttercup. In this case it is observed that four distinct members enter into the organization of the flower. The outermost set is a "calyx," whose individual members are the "sepals"; the next inner set is the "corolla," whose individual members are the "petals"; the "stamens" form the third set; and the "carpels" are in the centre. The sepals and the petals are the characteristic floral leaves, while the stamens and carpels are the spore-producing members (sporophylls). The calyx and corolla taken together are frequently spoken of as the "perianth," the name being specially applied in case the two are similar, as in the lily. Since the whole purpose of the flower may be said to be the production of seed, the stamens and carpels are the essential organs; without them no seed could be produced. In another sense, however, the calyx and corolla are the characteristic organs, since it is their association with the stamens and carpels which distinguishes the true flower of the highest group of plants (angiosperms).

Functions of Parts. The calyx is usually merely a protective structure, being generally leaflike or bractlike, and investing the more delicate inner members in the bud. The corolla is usually connected with pollination (q.v.), being in general the conspicuous and showy part of the flower. The stamens produce the pollen; while the carpels produce the ovules, which later become the seeds. The stamen usually has two regions, a stalklike portion called the "filament," and a spore-bearing region called the "anther." The carpel usually has two regions, the basal part, containing the ovules, being the "ovary," and the more or less elongated beaklike process from it being the "style." The style always presents in some portion, frequently the tip, a specially prepared surface, known as the "stigma," for the reception of the pollen. The name "pistil" is frequently applied to the carpel structures and is often a convenient name, although it is not an exact one. For example, each individual carpel may in certain cases be a pistil, as in the buttercup; while in other cases several carpels may have developed together as a single organ, which is also called the pistil, as in the apple. The term "pistil," therefore, may be defined as any organization of carpels which appears as a single organ with one ovary.

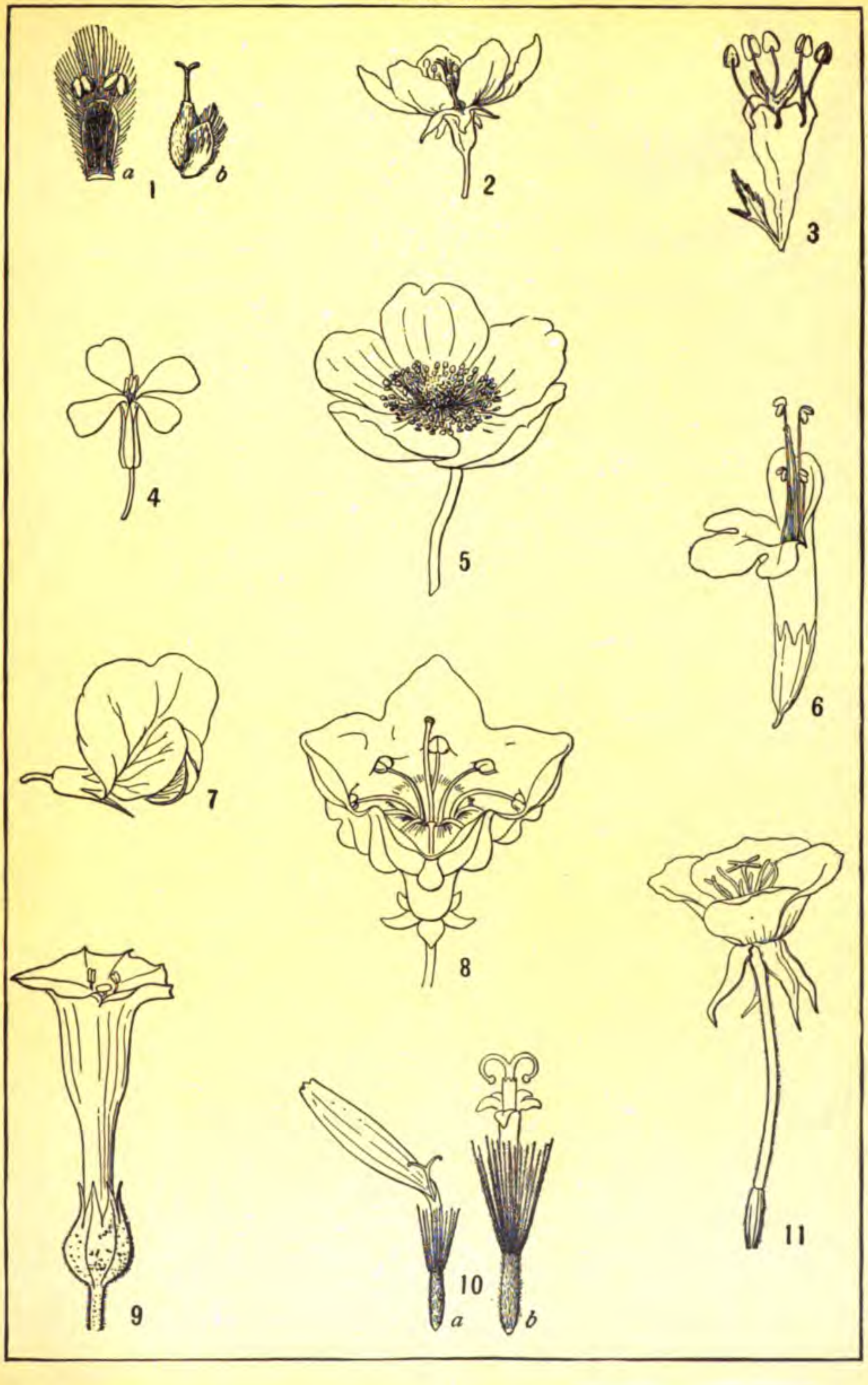
"Type Flower" and "Modifications." Since the structure of the flower is so extensively used in classification, there has come to be associated with it an enormous mass of technical terms, most of which are of no value except to the professional botanist. As the important terminology deals with the so-called "modifications," it will be given in connection with a description of the various relations which the floral members hold to one another. In the older morphology a so-called "type flower" was assumed, and all variations from it were regarded as modifications of this type. This false conception in great measure has been abandoned, and flowers are recognized as having developed along many different lines from exceedingly primitive conditions. For example, the flower of the lily was once regarded as a typical monocotyledonous flower, and all simpler forms were thought to be modifications of this type. The possible transition from the flower of a lily to that of a grass has often been cited, the meaning being that a grass flower is merely a reduced lily flower. The present view, however, is that the simpler grass flower is more likely to be a primitive condition than a derived one. It is impossible as yet to distinguish all the lines along which flowers have advanced, and the relations of these lines to each other. Certain prominent lines, however, are conspicuous and may serve as illustrations. In all of this evolution of flowers the end attained seems to be a better scheme for the transfer of pollen, chiefly by means of insects, or better devices for the scattering of seeds, or both. These conspicuous paths of advance may be summarized briefly as follows:

Diversity of Flowers. In the most primitive flowers the parts have a spiral arrangement. For example, the sepals, petals, and stamens are not in definite rosettes or cycles, but appear at different levels and may be indefinitely repeated. In this case there is no such thing as definite numbers. In the more highly developed flowers, however, the spiral arrangement passes into the cyclic, in which the members of each set form a definite rosette or cycle, in which the numbers are limited. Usually these numbers are definite for great groups, the prevailing number in the cyclic monocotyledons being three and the prevailing number in the cyclic dicotyledons being five or four. One of the common causes of diversity among flowers is the absence of one or more of the four sets, or of some member or members in a single set. This may be the primitive condition of the flower, in which the given set or member is not to be expected; or it may be a case of abortion or suppression, which means that organs which are to be expected have failed to develop, although they may do so partially. As prominent illustrations of such diversities the following may be mentioned. It frequently happens that but a single set of floral leaves appears, and it is customary to regard the missing set as the petals, such flowers being called "apetalous." In other cases neither calyx nor corolla appears, in which case the flower is said to be "naked." In still other cases the stamens are lacking, and if a pistil be present the flower is said to be "pistillate." If the pistil is lacking and the stamens are present, the flower is "staminate"; while if both stamens and pistils are lacking, the flowers are "neutral."

Other diversities arise from the fact that the members of a set may to greater or lesser degree lose their independence and develop in common, giving the appearance of coalescence. For example, the sepals may organize an urn-shaped or tubular calyx, or the petals may organize a corolla which resembles a tube, a funnel, a bell, etc. The terminology used in such cases implies that members originally separate have coalesced; but the fact is that there has been no coalescence of distinct parts, but a ringlike outgrowth instead of growth at separate points. Flowers with a corolla of this kind are said to be "sympetalous" ("monopetalous," "gamopetalous"). The same tendency is shown by the stamen set; while it is exceedingly common among the carpels, in which latter case the flower is said to be "syncarpous," resulting in the so-called "compound pistil." The sympetalous character of flowers is so definitely associated with natural groups that the character gives name to the great group Sympetalæ, which is one of the two large divisions of dicotyledons. The contrasting condition of flowers, viz., the occurrence of petals entirely distinct from one another, is called "polypetalous," such flowers being regarded as more primitive than sympetalous flowers.

Another source of diversity in flowers is the tendency of contiguous sets to become more intimately related than usual. This condition is common in sympetalous flowers, where the stamens are said to be "inserted upon the tube of the corolla." This apparent coalescence of adjacent sets is frequently called "adhesion," a term which implies that the two sets are normally distinct, but have become adherent. Such an explanation is no more true than that which was given of the apparent coalescence of the members of a single set. This tendency of different sets to arise together, rather than separately, has resulted in three well-marked conditions. When the sepals, petals, and stamens all rise from beneath the ovary, the flower is said to be "hypogynous," or to have a "superior ovary." This is the most primitive condition. When these three outer parts arise from the rim of an urnlike outgrowth from the receptacle ("torus"), which surrounds the pistil or pistils, the flower is said to be "perigynous." Finally, the insertion of the outer parts may be carried above the ovary, from the summit of which the

FLOWERS



1. WILLOW (Salix), showing staminate (a) and pistilliate (b) flowers; 2. PEAR (Pyrus); 3. ELM (Ulmus); 4. RADISH (Raphanus); 5. ANEMONE; 6. SAVORY (Satureia); 7. PEA (Pisum); 8. MOUNTAIN LAUREL (Kalmia); 9. TOBACCO (Nicotiana); 10. ARNICA, with ray (a) and dish (b) flowers; 11. EVENING PRIMROSE (Œnothera).

sepals, petals, and stamens seem to arise, such a flower being called "epigynous," or said to have an "inferior ovary."

Regularity and Irregularity. In the more primitive flowers the different members of a set are similar and are repeated uniformly about a common centre. Such a flower is said to be "actinomorphic," or "radiate," or more simply a "regular flower." In many cases, however, the members of a single set are not all alike, and this is particularly noticeable in the corolla. The unequal development of the members of a single set is called zygomorphism, or more commonly "irregularity."

The arrangement of the parts of the flower in the bud is known as "æstivation." See Bud. etc.

FLOWER, Benjamin Orange (1858-1918). An American author and editor, born in Ilion, Ill., and educated at Kentucky University. After some newspaper experience he settled in Boston and established the *Arena*. This magazine he edited until 1896 and from 1904 to 1909, in the interim having had charge of the *Coming Age*, which was eventually merged with the *Arena*. From 1909 to 1911 he was editor of the *Twentieth Century Magazine*. His publications include: *Civilization's Inferno* (1893); *The New Time* (1894); *Gerald Massey, Poet, Prophet, and Mystic* (1895); *Whittier, Prophet, Seer, and Man* (1895); *The Century of Sir Thomas More* (1896); *Persons, Places, and Ideas* (1896); *How England Averted a Revolution of Force* (1901; new ed., 1911); *Christian Science as a Religious Belief* (1909).

FLOWER, Roswell Pettibone (1835-99). An American capitalist and Democratic politician, born at Theresa, Jefferson Co., N. Y., where he worked on a farm and in a mill. He was clerk in a hardware store, assistant postmaster, and then a jeweler at Watertown. Going to New York in 1869 he made the banking house of Flower & Co. a recognized power in Wall Street and became director in various corporations. He was a member of Congress in 1881-83 and in 1889-91; was mentioned as a candidate for the Democratic nomination for the presidency in 1888; and was Governor of New York in 1892-94. In 1896 he was a Gold Democrat. His benevolences included Flower Hospital and St. Thomas's Home in New York City. A statue of Governor Flower by Saint-Gaudens was unveiled at Watertown, Sept. 1, 1902.

FLOWER, Sir William Henry (1831-99). An English biologist and anatomist, born at Stratford on Avon, Warwickshire. He graduated in medicine at the University of London in 1851 and was an assistant surgeon in the medical service during the Crimean War. In 1861 he was appointed curator of the Hunterian Museum of the Royal College of Surgeons of England, where he also became professor of comparative anatomy and physiology in 1870. From 1884 to 1898 he was director of the British Museum of Natural History. He was elected a fellow of the Royal Society in 1864 and from 1879 until his death was president of the Zoological Society of London. He was also president of the Anthropological Institute from 1883 to 1885, and at various times president of the anthropological section of the British Association for the Advancement of Science. His principal investigations have to do with the Monotremata and the marsupials, and his researches concerning the structure of the brain of lemurs and apes are also important. He was the first to show that marsupials retain throughout their life history a permanent dentition, with the exception of one tooth, and that thus marsupials are differentiated from the other mammals. His publications, in addition to numerous memoirs, include: *Diagrams of the Nerves of the Human Body* (1861); *An Introduction to the Osteology of the Mammalia* (1870; 3d ed., revised, 1885); *The Horse* (1890); *Essays on Museums and Other Subjects* (1898).

FLOWER AND THE LEAF, The. A poem published in the 1598 edition of Chaucer's works, but not now believed to be his.

FLOWER BEETLE. Any of many small beetles seen almost exclusively on flowers, feeding on pollen. The most common flower beetle in the northern United States is a yellowish-brown, black-spotted species (*Euphoria inda*), which feeds not only on the pollen of all sorts of flowers, but on the stalk and ears of young Indian corn and on various fruits and may become a serious pest. It flies in early spring close to the ground, with a humming sound very much like that of a bumblebee, and a second brood appears in September.

FLOWER BUG. One of a family (Anthocoridæ) of small bugs, distinguished from bedbugs by their long oval forms and by having wing covers and ocelli. Not many species are known, but individuals are extremely numerous, haunting flowers, where they hunt out and devour plant lice, lace bugs, and similar minute pests of horticulture. The commonest species is *Triphleps insidiosus*, which, like some of the others, is shining, black and white.

FLOWER DANCE. There were two distinctively floral dances in Greece—the anthema, which was danced by women at private gatherings, and the May dance, in which the most beautiful young girls decorated themselves with flowers and danced singing in honor of the goddess of the May. The song which was sung while dancing the anthema was as follows:

"Where's my lovely parsley, say?
My violets, roses, where are they?
My parsley, roses, violets fair,
Where are my flowers? Tell me where."

FLOWER-DE-LUCE. See Iris.

FLOWER OF COURTESY, The. A poem attributed to Chaucer by Thynne. The preponderance of evidence, however, points to John Lydgate as the author.

FLOWER PECKERS. A book name for a rather indefinite group of small, brightly colored East Indian birds, sometimes called honey peckers, of which the Australian *Dicæum* is regarded as a type. They have many characteristics of the creepers, but are provisionally set apart into a family Dicæidæ.

FLOWERPOTS. Receptacles of unglazed earthenware, tapering a little towards the bottom, which is perforated with one or more holes. (See Pottery.) Those of smallest size are only about two inches deep and are used chiefly for seedlings to be soon again transplanted. For plants which require a pot of more than 12 inches deep and 18 inches wide, wooden boxes or tubs are generally provided, although earthen pots of much larger size are sometimes made. The flowerpot is usually placed in a saucer of the same material, but when plants growing in flowerpots are placed out of doors the saucer is often dispensed with. For ornamental use flowerpots are sometimes glazed, or made in the shape of vases. In filling flowerpots small stones or bits of broken pottery are placed in the bottom, to prevent water from lodging there and souring the soil in which the plant is to grow.

FLOWERS. A term applied by the older chemists to any light pulverulent substance obtained by sublimation, as flowers of antimony, flowers of arsenic, flowers of benzoin, flowers of sulphur, flowers of zinc, etc.

FLOWERS, Artificial. Copies of natural flowers made of a great variety of materials and used for both scientific and decorative purposes. To the former class belong the collection of flowers in the possession of Harvard University, which are made wholly of glass and illustrate the flora of the United States. Flowers and leaves of painted linen, and of horn shavings stained in various colors, were made by the ancient Egyptians, and it is said that Crassus of Rome made such artificial flowers of gold. The Chinese form beautiful flowers out of rice paper and from the pith of a kind of bamboo, while the Japanese show wonderful dexterity in reproducing the forms and colors of natural flowers. The natives of the Bahama Islands and other savages arrange small and daintily tinted shells into sprays of flowers. Feathers have long been made into beautiful flowers by the South American Indians. In Italy the cocoons of silkworms are dyed and used extensively for this purpose. Fine imitations of flowers are made from paper, especially crape paper, ribbon, velvet, and the thin laminæ of whalebone. Wax-flower making is a distinct branch of the art. At one time the making of wreaths of flowers out of locks of hair, the gifts of friends, cleverly woven with wire, was a favorite form of fancy work among ladies. The Italians were the first to bring the art of makin artificial flowers to a high state of perfection. At present the chief centres for the manufacture of flowers for the decoration of ladies' bonnets and dresses, for head wreaths and for table and house decoration, are in France and America. French immigrants probably introduced the industry into America. As early as 1840 there were 10 establishments for making artificial flowers in New York City. The United States census of 1849 reported 23 establishments making artificial flowers, with 434 wage earners and a product valued at $146,120. By 1909, according to the thirteenth United States census, the number of establishments had increased to 225, giving employment to an average number of 4835 wage earners, with an annual output valued at $9,041,447.

The materials of which the artificial flowers commonly in use are made are silks, cambric, jaconet, and fine calico, besides muslin, crape, and gauze for particular flowers, and satin and velvet for thick petals. The tinting of petals of the best flowers requires some amount of delicacy and skill. In nature the tint of each petal of a flower is rarely uniform; and the best artificial flowers represent the natural variations with great accuracy. The petals of a rose, e.g., are dyed by holding each separately by pincers, and then dipping it in a bath of carmine, and afterward into pure water, to give delicacy of tint; but as the color is usually deepest in the centre, a little more dye is added there while the petal is still moist, and this diffuses itself outward in diminishing intensity. The whiteness at the insertion of the petal is produced by touching that part with pure water after the rest is dyed. The artificial flowers of trade, however, are colored by no such delicate means. The material of which they are made is simply dyed in uniform color, in sheets, and any variation in tint is effected by a few daubs of the paint brush after the petals are cut out. The aniline dyeing solutions are heated by steam in great copper kettles, into which the material is dipped. The material is then passed through a wringer and stretched upon frames to dry. The next step is to size the material by applying a solution of dextrin and starch evenly to the surface while the cloth is still stretched upon the drying frames. The material is now ready to be cut into the leaves or petals of flowers. This is effected by sharp steel cutters, made of the desirable size and shape. A large stock of these irons is necessary, as special forms and sizes are required for each flower. Ten or 12 sheets of the material of the same color are carefully and smoothly laid in a pile on a leaden block, and the cutter, with a wooden mallet, drives the sharp steel stamp through the pile and repeats the process till the sheets are riddled with holes. The leaves and petals are now passed on to another workman, who presses the veins into them by means of a pair of dies. (See Dies and Die Sinking.) A petal is placed in the lower die and the upper die fitted over it. The dies are placed under a press, and a turn of the wheel presses the vein lines into the stiff material.

The next process in shaping is that of "goffering," or "gauffing," by means of which the hollow form is given to petals. For hollowing petals the goffering iron is simply a polished iron ball, mounted on an iron wire in a handle. It is heated and waxed, the petal is placed on a cushion, and the iron pressed against it. A variety of other forms of goffering irons are used, such as prismatic rods and bent wires.

The stamens are made of coarse yellow thread on which corn meal is gummed. The centres of daisies are usually of wool and cotton dyed yellow. Flowers are put together wholly by hand and are built up from the centre; the pistils and stamens are tied in a bunch to a piece of wire; the petals are arranged in order and pasted; then the sepals of the calyx are pasted outside of these and further secured by winding fine thread or silk round the lower parts. Other wires are inclosed with this thread and form the stalk, which is bound round with green tissue paper; and at proper intervals the leaves are inserted by means of fine wires, to which they are bound, the ends of these wires being bound in and incorporated with the stalk and concealed by the green paper, or a green rubber tubing may be used for the stems. Buds are made of taffeta, tinted and stiffened, and stuffed with cotton. When a variation of tint is desired on a petal, it is colored with a brush. The petals are taken directly from the cutter to the artist, who performs his work with great deftness and rapidity. Twenty or 30 petals are spread out on a tray, and the artist touches up one after another with the paint prepared for the purpose.

Besides the flowers copied from nature there is a considerable demand for what are called "fancy flowers," most of which are invented by the manufacturer to use up waste and spoiled fragments originally designed for better purposes. Flowers suitable for mourning are prepared by coating leaves, flowers, etc., with strong gum and then dusting upon them powdered galena. This substance, a sulphuret of lead, is formed naturally in lustrous cubic crystals of a dark-gray color, and however finely it is powdered, the fragments still tend to retain the same shape and surface and thus present a number of flat glittering facets. Consult M. Van Kleeck, *Artificial Flower Makers* (New York, 1913).

FLOWERS, Language of, or Floriography. The language of flowers is supposed to have been used among the earliest nations; but the Greeks are the first users of whom we have any trustworthy records. They carried it to a very high degree, using flowers as types of everything interesting, public as well as private. The Romans also had a well-developed flower language, and its study was revived during the Middle Ages, when chivalry became preëminent; and it received great development at the hands of the Roman church. Flowers have had an important part in all mythologies. Oak was the patriot's crown, bay the poet's, and the myrtle the crown for beauty. The olive was the token of peace, as the ivy was the emblem of Bacchus. The significance of many flowers is derived from their properties. The amaranth has been selected to typify immortality because of its duration. The rose, by universal suffrage made the queen of the flowers, has a symbolism varying with its color: a single red rose signifies "I love you"; the small white bridal rose typifies happy love; and the moss-rose bud a confession of love. The following are some well-known flowers, with their symbolism as used in poetry:

Anemone—Frailty, anticipation.
Apple blossom—Preference.
Buttercups—Riches.
Calla—Magnificent beauty.
Candytuft—Indifference.
Cowslip—Youthful beauty.
Daffodil—Unrequited love.
Dandelion—Coquetry.
Forget-me-not—True love.
Foxglove—Insincerity.
Geranium—Deceit.
Gentian—Virgin pride.
Goldenrod —Encouragement.
Heliotrope—Devotion.
Honeysuckle—Fidelity.
Hyacinth—Sorrow.
Lilac—Fastidiousness.
Marigold—Contempt.
Lily—Majesty, purity.
Narcissus—Self-love.
Pansy—Thoughts.
Poppy—Oblivion.
Snowdrop—Friend in need.
Sweet William—Gallantry.
White violet—Modesty.

Consult S. J. B. Hale, *Flora's Interpreter* (4th ed., Boston, 1835), and Charles Welsh, *The Language, Sentiment, and Poetry of Flowers* (New York, 1912).

FLOWERS, National and Symbolical. The use of flowers as symbols began in very early times and has continued to the present day among nearly all nations. Biblical literature contains many allusions to floral symbols, and China once possessed a complete floral alphabet. At the present day the Chinese make a lavish use of flowers in many of their public and religious ceremonies, on occasions of marriage, death, and burial, as well as in the decoration of the temples of their deities, the graves of their dead, and their private dwellings.

The monuments of Egypt and Assyria also have upon their surfaces a code of floral calligraphy whose meaning can now be but dimly guessed. Here the sacred lily, or lotus, of Egypt plays a prominent part. It was consecrated to the gods and became in time the national emblem. The Egyptian deity Osiris (q.v.) is portrayed with his head crowned with this blossom; it is painted on the walls and carved on the doors of the temples. See Lotus.

India had in her magnificent flora a wonderful field for poetical genius. In India the lotus was, as it is now, the sacred flower. In its bosom Brahma was believed to have been born; and it is to the Hindus the chariot of their Cupid, whom they picture as first seen pinioned with flowers and floating down the sacred Ganges upon it. The lotus became, through its association with religious rites, an emblem of mystery and was hence frequently used for architectural adornment. Among the Hindus distinguished strangers are welcomed with garlands of flowers as tokens of hospitality, and the shrines of the favorite deities of the Hindus are decorated with these emblems.

In Persia a yearly festival is held called the "feast of roses," which lasts as long as the roses bloom. The literatures and the languages of the Hindu, Turkish, Persian, Arabic, and Malay races abound in floral symbols. In Japan the lotus is a symbol of purity. The Japanese picture their deity reclining upon the leaf of a water lily or lotus and often name their children after beautiful flowers. The chrysanthemum, or "golden flower," is the national emblem, and the country is popularly called the "Land of Chrysanthemums," and a day is yearly set apart in that country, in November, for the "festival of chrysanthemums." (See Japan, *Flora*.) From early days there have been two royal crests in Japan: one is the paulownia tree, which is seen only on the seals of the Emperor's family; the other, the chrysanthemum, which is used for all governmental symbols outside the palace. The flower is embroidered on their flags and banners and printed on important papers. It is stamped on their silks and has decorated their finest porcelain for hundreds of years. Cherry blossoms, too, figure largely among the Japanese. See Rising Sun, Order of the.

European florigraphy had its rise in Greece and many of the old floral customs still linger in the Grecian islands. The Greeks seem not only to have entertained the most passionate love for flowers, but to have adopted them as typical of every interesting occurrence, public or private. Wooers decorated the doorways of their beloved ones with garlands of flowers; the illness of the inmates was indicated by buckthorn and laurel hung across the lintels; while at death parsley was sprinkled over the remains, and the head was crowned with various symbolical flowers. At the public games of Greece the victor was invariably rewarded with some floral emblem. The Olympian winner received a garland of wild olive (see Olive); the Pythian victor received a laurel crown. In the Nemæan games a crown of parsley was awarded; in the Elean, a crown of pine leaves. The youths crowned themselves with flowers in the fêtes, the priests in religious ceremonies, and the guests in convivial meetings. Garlands of flowers were suspended from the gates of the city in times of rejoicing. The conventional epithet of Athens was "the city of the violet crown," the violet being chosen as the national emblem. Consult: Gulick, *The Life of the Ancient Greeks* (New York, 1902); Ogle, "Laurel in Ancient Religion and Folk-Lore," in *American Journal of Philology*, vol. xxxi, pp. 287–311 (New York, 1910); "The House-Door in Greek and Roman Religion and Folk-Lore," ib., vol. xxxii, pp. 251–271. See Adonis; Flower Dance.

The highest honor that a Roman soldier could receive was the civic crown made of oak leaves. For this and other honorific crowns used by the Romans, see Crown. The Latins instituted a festival in honor of Flora in 238 B.C., according to tradition, during the reign of Romulus; but the public games, or *Floralia*, were not regularly established until 178 B.C., when it was ordained that the feast should be annually kept on the 28th day of April, lasting five days. Among the Latins, as among the Greeks, flowers were used as symbols on all public occasions. At marriages the bride wore a wreath; the doorposts of the bridegroom's house were adorned with flowers, birth was heralded by them, and the bier of the dead was strewn with them.

In the Iberian Peninsula floral symbolism is principally indebted to Roman Catholic legends for the little vitality it there possesses. When Moorish power in Spain had been crushed, and Ferdinand and Isabella entered Granada, the pomegranate, the device of Granada, was emblazoned on the arms of Spain and became the national emblem. In France the language of flowers has many votaries, and a lavish use is made of flowers in public ceremonies and as a means of expressing various sentiments. The authentic use of the *fleur-de-lis* as the national emblem of France dates from King Louis VII. When setting out on his crusade to the Holy Land, he chose this flower for his badge. The French flag had, from 1376 on, a cluster of the *fleur-de-lis* upon its face, but they were replaced by Henry IV (1553–1610) with the single *fleur-de-lis* on a blue ground, which was the design on the old French flag. This flower is seen carved upon the royal palaces and public buildings of the French, woven in their tapestries, engraved upon their plate, and stamped upon their wares. Napoleon I upon becoming Emperor of France changed the emblem to the bee, but the lily was afterward restored. The violet was also adopted as the badge of the Bonapartists in France after the banishment of their leader to Elba, its signification being "to return in spring." Flowers have not seldom been used as the badges of partisans in other countries; thus, in the long struggle between the Imperialists and the Pope during the twelfth century, the white lily was the party badge of the Ghibellines, while the Guelphs wore the red lily. See Guelphs and Ghibellines.

The cornflower, or *Kaiserblume*, may be considered the national flower of Germany. When Louise, the mother of Emperor William I, was forced to take refuge with her small family in the outskirts of the city of Berlin while Napoleon's army was occupying the city, the children cried from hunger and exposure. In order to pacify them the beloved Queen-mother gathered the cornflowers growing by the wayside and wove them into garlands; from that time this blossom was the favorite flower of William and his people.

The national emblem of England, the rose, is of historic interest. Edward I wore the red rose, as did his brother Edmund Crouchback of Lancaster. John of Gaunt took a red rose on his marriage with Blanche, heiress of Lancaster; and his younger brother, Edmund Langley, Duke of York, adopted the white, which he handed down to his descendants. The wars known as the "Wars of the Roses" afterward waged between Henry VI of Lancaster and Edward IV of York, for possession of the crown of England, gave a deeper significance to these badges; but the marriage of Henry VII of Lancaster with Elizabeth of York, eldest daughter of Edward IV, united forever the rival houses and ended the civil war. (See Roses, Wars of the.) The two roses then became united under the title of the Tudor Rose, which was made the national flower. The rose has been termed the "flower of flowers." The ancients regarded it as the emblem of silence, of love, and of joy. Cupid was frequently represented as offering a rose to Harpocrates, the god of silence. On festal occasions a rose was suspended over the table, intimating to the assembled guests that the conversation was to be literally as well as metaphorically *sub rosa*, or "under the rose." The name Plantagenet is said to have arisen from the fact that Geoffrey of Anjou wore sprigs of the broom plant (*planta genesta*) in his cap.

In the reign of Malcolm II of Scotland (1010) the country was invaded by the Danes, who attempted to storm an important fortress on the most eastern point of Scotland. Their preparations being completed, and the night well advanced, they approached the castle stealthily, removing their shoes. Upon reaching the moat they plunged in, expecting to swim across. Suddenly the air resounded with cries of rage and distress; for the moat was filled with thistles, not with water. Thus the inmates were aroused to a sense of their danger, and Scotland was saved. Out of gratitude for their escape the Scots adopted the thistle as their national emblem, with the appropriate motto, *Nemo me impune lacessit*. See Thistle, Order of the.

St. Patrick, the patron saint of Ireland, while preaching one day was at loss to explain the doctrine of the Trinity. The people failed to understand and refused to believe that "there could be three Gods and yet one." The preacher paused and, stooping, plucked a shamrock growing at his feet. "Do you not see," said he, "in this wild flower how three leaves are united on one stalk, and will you not then believe what I tell you, that there are indeed three persons and yet one God?" By this simple means his audience was enabled to comprehend his meaning, and at once embraced the doctrine. From that time this flower became the national emblem of Ireland.

It is recorded that on St. David's Day, March 1, 640 A.D., the Welsh, under Caedwalla, were about to march against an English army. To distinguish themselves from the enemy, they adopted the badges most easily obtained; each man plucked a leek from the field through which he was passing and stuck it in his cap. The Welsh arms were victorious, and the leek was adopted as their national emblem in grateful memory of this event. It is worn by loyal Welshmen on every anniversary of St. David's Day.

Mexico has chosen the nopal cactus, or prickly pear, as her national emblem. The design on the Mexican coat of arms is an eagle, holding a snake in its beak, perched upon a cactus stem. It is said that, after the Aztecs had wandered for many years, a wise man told them that, when they reached a place where they found an eagle perched upon a rock, there they should build their city. As they drew near Lake Tezcuco, they saw an eagle perched upon a branch of the nopal growing out of a rock. Here they built their city, giving it a name meaning "Nopal on a stone."

In England, ever since the death of Lord Beaconsfield (1881), the primrose has been adopted as the badge of the Conservative party, in the belief that it was the favorite flower of their great leader. This belief is said to be a mistaken one and to have originated in an incident that happened at the time of his funeral. The Queen sent a mass of primroses on that occasion with the inscription, "His favorite flower," meaning her own husband, Prince Albert. It was, however, understood as referring to Lord Beaconsfield, so that on the anniversary of his death (April 19) every Conservative now wears a bunch of primroses, and the day is known as Primrose Day. See PRIMROSE LEAGUE.

The United States cannot be said to have a generally accepted national flower. In 1889 an attempt was made to secure a general expression of opinion in favor of some one flower, and the goldenrod, as being indigenous and more widely distributed than in any other country, received the majority of the suffrages; but a national flower is usually recognized only when tradition and legend give it significance and not because of a popular vote. By acts of the Legislature some States have adopted State flowers: Iowa, the wild rose; Maine, pine cone and tassel; Michigan, apple blossom; Montana, bitter root; Nebraska, goldenrod; Oregon, Oregon grape; Vermont, red clover; Colorado, white and blue columbine; Oklahoma, mistletoe; Utah, sego lily. In other States flowers have been selected by vote of the school children, or for other reasons are popularly recognized: California, the California poppy; Idaho, syringa; Kansas, sunflower; Minnesota, moccasin flower; Nevada, sagebrush; Washington, rhododendron; Georgia, Cherokee rose; New York, goldenrod. Consult: *Flowers of History, Especially such as Relate to Britain, from the Beginning of the World to the Year 1307*, by Matthew of Westminster (2 vols., London, 1853); Folkard, *Plant Lore* (ib., 1884); Haig, *The Floral Symbolism of the Great Masters* (New York, 1913).

FLOWERS AND INSECTS. The dependence of insect life on that of plants is illustrated by the fact that in Germany between 500 and 600 species of insects obtain their livelihood by feeding upon the oak, while in the United States nearly the same number of species have already been found to prey on the native oaks. The elm, willows, and pines also afford food and shelter to hundreds of species, the insect pests of the apple and other fruit trees also amounting to many hundred species each. Some insects bore in the roots; multitudes of borers penetrate into the trunk, branches, and twigs, as well as bark; while still greater numbers of caterpillars feed upon the leaves. The result of the life within the tree—in the wood or bark, or in veining the leaves—is very marked, as the borers are profoundly modified in various ways. Many borers, in consequence of their peculiar mode of life, have long, often flattened, bodies, are eyeless, and have lost their limbs, in part or wholly, through disuse, while their jaws, by which they eat their way through the wood, are enlarged and otherwise adapted for their lignivorous habits. The manifold adaptations of the larvæ of beetles, as seen in thousands of species, afford admirable examples, in the opinion of Lamarckians, of the effects upon a plastic organism of strains, stresses, and of use and disuse, in the production of the form of the body. It may be said in general that as soon as land plants, more or less treelike in habit, however low or primitive in character, appeared (such as the treelike club mosses and allied flowerless forms of the Devonian and Carboniferous periods), a new world hitherto unoccupied was opened up to insect life, of which the insects speedily took advantage.

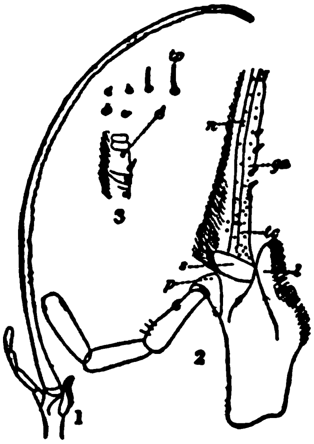
The earliest insects, as cockroaches, locusts, and the like, fed on dead leaves or herbaceous plants; others were aquatic and carnivorous. But as soon as plants became treelike and grew in vast forests, new habitats were opened up, of which the insects immediately took advantage. It will thus be seen that the intimate relation between plants and insects must have taken place very early in geological history.

Effects of Flowers in Modifying Insects. Coming now to consider the mutual relations and dependence of insects and flowers, we will first take up the subject of the adaptation of insects to feeding on the pollen or nectar of flowers. A few insects, some beetles and certain caterpillars, may devour the petals of flowers; but the chief attraction lies in the pollen or the nectar, and as the result we shall see that insects visiting flowers for the purpose of feeding upon their floral products are remarkably modified for this purpose. Hermann Müller has shown the way in which insects are fitted to obtain their floral diet, how many characters of flowers and of their visitors "have been developed in reciprocal adaptation, and which can therefore only be understood when considered together."

The insects which feed on pollen or nectar, and thus fertilize flowers, are certain bugs, beetles, flies, most moths and butterflies, wasps, and bees. It should be noticed that none of the primitive, generalized, or net-veined insects are included among these floral visitors. They contented themselves, as they do now, with the rank growth of herbaceous plants.

The true bugs (order Hemiptera) have the mouth parts formed into a long beak adapted for piercing the flesh of animals or the leaves or stems of plants. But some of them (*Anthocoris*, etc.) are fitted by their small size to creep into and suck honey from many different flowers. Minute insects of another group (*Thysanoptera*) are constantly found in flowers of all sorts, where they feed both on pollen and honey. Müller says they seize a single pollen grain in their jaws and convey it to the mouth; they obtain honey by applying the mandibles and maxillæ together so as to form a short, conical sucking apparatus. Their jaws and accessory jaws (maxillæ) are long and narrow, tapering to a sharp point, and here again we have long, slender, beaklike mouth parts adapted for probing flowers.

The modifications of the maxillæ (jaws) of certain flower-visiting insects, adapting them in some cases for playing the part of butterflies and bees, are remarkable. Leaf-feeding beetles, such as chafers and chrysomelids, do much harm by devouring petals or entire flowers, but there is no resulting modification. "A review," says Müller, "of the mode of life of insects which visit flowers, and of the families to which they belong, shows continuous gradations from those which never visit flowers to those which seek them as a secondary matter and finally to those which entirely depend upon them." In the great group of longicorn beetles (Cerambycidæ), in which the head is generally short, the jaws are directed downward, so they can use them in biting the bark of trees in order to oviposit in it. There is a group (Lepturidæ) which frequents flowers. These have the head lengthened out in front, a necklike constriction behind the eyes, and consequently the power to direct the mouth forward while the prothorax is elongated and narrowed in front; besides this, the lobes of each maxilla are furnished with a brush of hairs. All these departures from the normal type and customary habits are the result of a process of adaptation to a floral diet. Müller attributes this to natural selection, but one will readily perceive that this view is not practical nor adequate. There may be another point of view. As this type of beetles multiplied and ordinary food became scarce, competition set in, necessities of existence drove the insects to the unusual diet of pollen and honey, and probably the body became modified as the result of constant effort in straining after the nectar at the bottom of flowers, and the creature became long-necked, long-headed, and its tongue-like maxilla especially adapted for brushing off and collecting grains of pollen. The case reminds one of the probable series of causes which led to the formation of the long neck and slender head and tongue of the giraffe.



MAXILLA OF NEMOGNATHA.

1. Maxilla (entire), showing the prolonged galea. 2. Enlarged view of basal part of maxilla, to show the taste papillæ (*tp*), and cups (*tc*) on the galea (*ga*); *n*, nerve—a ganglionated nerve supplies each taste papilla, or cup; *l*, lacinia; *p*, palpifer; *s*, subgalea. 3. Part of end of galea, more enlarged to show the imperfect segments and the taste organs. (Henslow.)

Other beetles gather pollen, and their mouth appendages are adapted in accordance with this habit, while among certain families (e.g., Mordellidæ, Œdemeridæ) all the species in a perfect state depend entirely on a floral diet. The most remarkable of all beetles adapted for sucking honey is the flower-visiting *Nemognatha* (which means "threadlike jaws"), in which the galea of each maxilla is of enormous length, so that the two together form a rude sucking tube, roughly comparable with the tongue of the butterflies. It is believed to be very sensitive, as it contains many taste cups. Here we see carried out almost to excess the idea of a tongue adapted for probing deep corollas. It is a case of convergence, where the action of similar efforts and mechanical strains have gradually resulted in structures of the same form in insects belonging to entirely different orders.

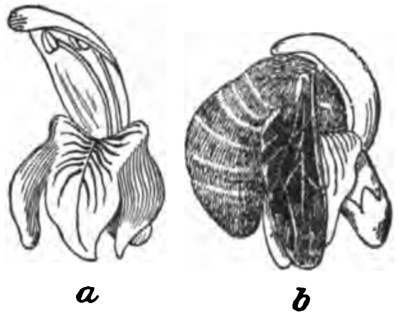
Flies. The majority of the flies (Diptera) resort to flowers for the little food they require in the imago state. And here the mouth parts are very different in structure from those of biting insects, the long proboscis being a modification of a portion of the labium, representing the tongue, or "lingua," of other insects. The beautiful yellow, wasplike drone flies (Syrphidæ), so abundant about flowers and so important as fertilizers, depend mainly or exclusively on a floral diet; and here, as Müller states, "are found the most perfect adaptations to a diet alternately of pollen and honey." The complicated proboscis ends in two broad flaps. These flaps are "admirably adapted for seizing the pollen, for grinding it down, and for passing it backward, the apposed surfaces of the two flaps being closely set with parallel ridges of chitin, by which the pollen grains are easily held fast and shoved into the entrance of the groove. Diptera, like the house and allied flies (Muscidæ, also the Stratiomyidæ), visit flowers to obtain both pollen and honey. These flaps are wanting in other flies, as the mosquito, and in the Bombyliidæ, which have enormously long tongues, as well as in other families (Empidæ and Conopidæ), and these flies visit flowers, probing them for the honey alone. Now, in these flies the head itself is not especially modified, but in *Rhingia* the head is developed into a long snout, the tongue being longer than the whole body. This fly (one of the Syrphidæ) is remarkably intelligent, probing the deeply hidden nectary of the iris and many other flowers. The species of *Empis* carry their long, thin, straight proboscis directed downward; hence they chiefly resort to erect flowers, into which they can plunge their proboscis vertically. In all these flies there is great variation in the shape and degree of specialization of the mouth parts, these being in intimate relation with the habits of these highly specialized insects.

Hymenoptera. Still better adapted than the flies are the wasps, and especially the bees, which rely almost exclusively on a floral diet and are most important as fertilizers of flowers. In bees (q.v.) the mouth parts are wonderfully adapted for probing flowers, the maxilla being specialized in a variety of ways, while with its stout mandibles the bumblebee can cut a hole through the corolla of salvia or wistaria without taking the trouble, as the honey bee does, to seek out the nectary. Besides the mouth parts, the hairy legs, especially those of the hinder pair, are so modified as to form pollen baskets (corbicula), in which the pollen is heaped, or the bristly hairs on the underside of the hind body of the leaf-cutter bee are adapted for this purpose, while the hairs on most bees are "spinulose," or stiffly feathered, for the purpose of carrying the pollen dust—all of which means of obtaining and carrying pollen are of direct importance in the fertilization of flowers. All these highly complex structures have evidently been brought about in response to the complicated series of muscular efforts and physical strains resulting from the attendance of these insects upon flowers.

The perfection of adaptation is attained in the moths and butterflies. These creatures and birds are clearly the most highly and wonderfully specialized of all animals. The butterfly is a most delicate and elaborate living flying machine, and all its characteristic structures have been drawn out in response to its mode of life, and of all the organs its spiral tongue is the most marvelous in mechanism and adaptation. That the tongue (maxillæ) has been evolved in response to the visits to flowers with a deep corolla is, among other facts, suggested by that of its entire absence in many silkworm moths. These sluggish, short-lived insects do not take liquid food, consequently by disuse the tongue is either in part or in certain forms entirely atrophied. The steps in development and specialization of the tongue of Lepidoptera, which is adapted for probing either flat or long and tubular corollas, may easily be traced. The end of the tongue is sometimes highly specialized. "Peculiar stiff, sharp-pointed appendages at the end of the laminæ enable them also to tear open delicate succulent tissues and make use of the sap in flowers which secrete no honey." In response also to severe impacts and strains the tip of the tongue of certain moths (*Ophideres*) is so spiny that it can pierce the skin of plums, peaches, and even oranges. In length the tongue may vary from a minute pointed rudiment scarcely a millimeter in length to that of the hawk moths, which may be 80 millimeters long, while in a Madagascar sphinx the tongue is 9¼ inches in length, and as there are said to be orchids with flowers as deep as this, there is evidently a relation of cause and effect between the phenomena.

Origin of Floral Structures Through Insect Agency. Having seen that insects have been highly modified in various ways by the use and disuse of organs, while seeking pollen and nectar, we may now inquire into the result of such visits or stimuli upon the flowers themselves. Many facts and ingenious suggestions have been made by Henslow in his *Origin of Floral Structures*. His conclusion is that a flower with a conspicuous corolla or perianth has originated from "a leaf bud of which some of the members have already differentiated into carpellary, others into staminal organs, the outer appendages being simply bracts, like, we will say, those surrounding the stamens or ovule of the yew." Insects probably visited the primitive flowers for pollen, but also pierced the juicy tissues for moistening the honey. Gradually the nectar was evolved, and after a time, the earliest-formed flowers having attracted insects to come to them regularly, a numerous series of differentiations would result. The corolla, in all probability, would be the first to issue out of the tracts. Other changes would follow by degrees and in different combinations. From regular, irregular flowers like those of the pea would arise. But all such changes "would be due to the responsive action of the protoplasm, in consequence of the irritations set up by the weights, pressures, thrusts, tensions, etc., of the insect visitors. Thus, then, do I believe that the whole floral world has arisen."

Irregular flowers, as that of the pea, have been made such by the visits of the bees and other external influences. When a flower is situated laterally and projects horizontally, or nearly so, an insect is compelled to alight upon it on one side only, when approaching it directly from the front. It then throws all its weight upon the organs on the lower or anterior side of the flower, as is the case with the keel petals of papilionaceous flowers, with the lips of labiates, etc.; or else its weight is sustained by the stamens or style, or by both together, as in *Epilobium angustifolium*, *Circæa*, veronica, larkspur, and monkshood; and whenever the stamens are declinate, as in horsechestnut, *Dictamnus*, *Echium*, amaryllis, etc. Henslow assumes that the primary cause of irregularity must come from without, from an insect—i.e., from the mechanical influence of its weight and pressures. "To this external irritation the protoplasm of the cells responds, and gives rise to tissues which are thrown out to withstand the strains due to the extraneous pressures of the insect, and so the flower prepares itself to maintain an equilibrium under the tensions imposed upon it, and irregularities are the result. Such modifications occur in the bilobed calyxes of furze and salvia, with many forms of lips, and in enlarged anterior petals or in dependent stamens, as those of aconite and *Epilobium*. The lip of *Lamium* consists of one much enlarged petal, which forms an excellent landing place for a bee to rest upon, while the two lateral petals, not being required, are atrophied to mere points. In like manner the two posterior petals are enlarged to form the hood, presumably due to the backward thrust of the insect's head." In the irregular flowers of the foxglove and the gloxinia, as well as petunia to a slight extent, and in the regular campanulate flowers, the tube of the gamopetalous corolla "has enlarged so as to permit the ingress of an insect which partly or entirely crawls into it; then it is this tubular part which, more especially having to bear the strain upon it, bulges outward or becomes more or less inflated in form, while the lip or anterior petal, not having to bear the entire burden, is not particularly enlarged, if it be at all." Henslow states that if no more than the head of an insect enter the flower, "then the corolla shapes itself to fit it"; thus the snowberry, *Scrophularia*, and *Epipactis* only admit the heads of wasps, which are the regular visitors of these flowers. How the deep tubular corolla of the evening primrose or the honeysuckle has been brought about is explained by the fact that butterflies, in probing their depths while on the wing, irritate the tube only, "which thus elongates and contracts, resulting in little or no irregularity in the flowers." Also flowers like the narcissus and evening prim-



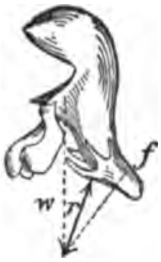
DAVERNOIA ADHATODOIDES.

a, the flower, an example of an irregular corolla adapted to the needs of its insect visitors; *b*, appearance when entered by a bee. "The weight of the bee must be very great, and the curious shape of the lip with its lateral ridges is evidently not only an excellent landing place, but is so constructed as to bear that weight. Moreover, the two walls slope off and are gripped by the legs of the bee so that it evidently can secure an excellent purchase and thus rifle the flower of its treasure at its ease." (Henslow.)

rose prevent the ingress of short-tongued insects. The origin of irregular flowers is illustrated by *Davernoia adhatodoides*, whose curiously shaped lip affords an excellent landing place for a big bumblebee; "moreover, the two walls slope off and are gripped by the legs of the bee, so that it evidently can secure an excellent purchase and thus rifle the flower of its treasure at its ease." The immediate cause of the shape of the wing petals of many papilionaceous flowers is attributed to the "weight of the insect in front, the local irritations behind, due to the thrust of the insect's head in probing for nectar, coupled with the absence of all strains upon the sides." Good examples of the occurrence of great thickening of the tissue just where the strain will be most felt are to be seen in the slipper-shaped flowers cypripedium, calceolaria, etc.

If the reader will turn to the article KINETOGENESIS, he will see how exactly parallel are the cases cited with those mentioned for plants by Henslow. In part he says: "In alluding to the above instances of levers and mechanical powers in plants, one mentally recalls how abundant they are in the distribution of the bones and muscles in vertebrates. I cannot help thinking, therefore, that the old view was fundamentally correct; that such have been gradually brought into existence by the efforts to meet the strain put upon them. If this be true, then one and the same law has prevailed in the evolution of organs in both the animal and vegetable kingdoms."

The accompanying figure explains how the forms of the calyx and corolla are adjusted to bear the weight of the insect. The bee, he says, alights on the lip and then partly crawls into the expanded mouth of the corolla, so that its weight now lies in the direction of *w*. The fulcrum will be at *f*, and the resultant of these is in the opposite direction to *r*. This is where the strain will be felt; "so that it is just at this point where the backward curvature takes place which gives strength to the corolla tube. This latter is greatly supported by the tube of the calyx, which, as stated, has a curiously thickened cylinder within the mesophyl."



LAMIUM.

A flower of *Lamium album*, showing distribution of forces under insect visitation: *w*, direction of pressure from the insect's weight; *f*, fulcrum; *r*, resultant, opposite to the direction of *r*.

Other structures, as projecting hairs, are so situated as to form obstructions to the entry of small insects which would be unable to pollinate the flower. In the gentian there are toothlike processes at the entrance of the corolla; in the Indian pipe and a *Daphne* a large circular stigma nearly blocks up the tube. Insects have been repeatedly observed to lick the various parts of flowers, and thus maintain an intermittent irritation and consequent formation of hairs and other products. Müller has often watched a fly (*Rhingia rostrata*) licking the staminal hairs of a *Verbascum*, and in many cases the hairs on the filaments offer a foothold to the insects while visiting the flowers, as in the mullein; such hairs, Henslow claims, "being the actual result of the insects clutching the filaments or rubbing them with their claws."

The chief attraction of flowers to insects is of course their honey glands, or nectaries, and these are thought by Henslow to have originated from the visits of insects which, at first attracted to the juicy tissues of flowers, "by perpetually withdrawing fluids have thereby kept up a flow of the secretion which has become hereditary, while the irritated spot has developed into a glandular secreting organ." These spots occur at different places in different flowers, "wherever the prevailing insect found it convenient to search." On the other hand, nectaries disappear when the whole flower degenerates and becomes regularly self-fertilizing or else anemophilous, so that insects do not visit them. Henslow even suggests that the insectivorous pitchers of *Nepenthes* may have been due to the external irritation caused by insects, for Sir J. D. Hooker had already shown that they originate from water glands. The continuous flow of nectar has its analogy in the daily regular, though intermittent, mechanical irritation, and its inherited effects, which keep up the secretion of milk in the goat and cow. Ants play their part in bringing about changes in what are called, for this reason, "ant plants." The hypertrophied stipules or thorns of *Acacia*, and the stems of *Myrmecodium*, as shown by Beccari, are due to the irritation set up by these insects, which bring about a hypertrophy of the cellular tissue. A small swelling appears on the tigellum of *Myrmecodium*, serving the purpose of a reservoir of water, which only grows larger through the agency of ants. Henslow also attributes the large honey pits at the base of the leafstalks on *Acacia sphærocephala*, as well as the terminal "fruit bodies" occurring on the tips of the leaflets, to the same cause—viz., the mechanical irritation of the ants.

Colors. The colors of flowers are primarily due to nutrition. The particolored spots and streaks leading down into the bottoms of flowers, called "guides" and "pathfinders," invariably lead to the nectaries, and these effects seem directly due to the visits of insects. "The guides," says Henslow, "like obstructing tangles of hair and nectaries, are always exactly where the irritation would be set up, and I take them to be one result of a more localized flow of nutriment to the positions in question. Instead, therefore, of a flower having first painted a petal with a golden streak to invite the insect, and to show it the right way of entering, the first insect visitors themselves induced the flower to do it and so benefited all future comers." The facts and theories suggested by the colors of flowers are further borne out by the geological history of fossil flowering plants and of those orders of insects containing flower-visiting forms. In the Paleozoic age there were, so far as yet known, no flowers, nor any moths, flies, ants, or bees. The first flowering plant, the screw pine, appeared in the Permian, but its flowers were greenish and inconspicuous. Early in the Mesozoic age more modern plants appeared, and by this time the most primitive beetles, moths, and hymenopterans probably arose, although the traces discovered are very scanty. But at the opening of the Upper Cretaceous vast forests of deciduous trees clothed the uplands, while in the jungles, in the plains, and in the openings of the forests true flowers abounded, since fossil composite blossoms, like the sunflower, occur in the Upper Cretaceous clays of New Jersey. Now the remains of moths, butterflies, many flies, ants, and bees abound in the Middle Tertiary, and undoubtedly their forerunners existed in the Cretaceous, so that we are justified in assuming that flowers and the insects which visit them were nearly simultaneously brought into existence, and from all that has been said it is a reasonable theory to advance that the forms of flower-visiting insects were the result of the presence of flowers, and that flowers have been modified from small greenish forms of inflorescence into the beautiful creations which now deck the fields and adorn our gardens.

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FLOWERY KINGDOM, The. A name for China.

FLOWING WELLS. See Artesian Wells.

FLOW STRUCTURE. See Igneous Rocks.

FLOX ÆʹRIS (Lat., flower of copper, from *phlox*, Gk. φλόξ, flame, flower, from φλέγειν, *phlegein*, to blaze, and *æs*, copper). A term applied by the older writers on chemistry to the finely divided powder obtained by pouring water on the surface of freshly melted copper and consisting of the red (cuprous) oxide of copper.

FLOY, James (1806–63). An American Methodist clergyman, born in New York City. He studied at Columbia College and at the Royal Botanical Gardens, London, was a clerk at the Methodist Book Concern, and, entering the ministry in 1835, held pastorates in and around New York. For attending an Abolition convention he was censured by his conference. He was editor of the *National Magazine* and secretary of the Methodist Tract Society (1856–60), editor in chief of the *Methodist Hymnbook* of 1849, edited the posthumous works of Stephen Olin, contributed many articles to the *Methodist Review* and other Methodist periodicals, and wrote: *Bible Morality* (1861); *Lessons in Bible History* (1861); *Old Testament Characters Delineated and Illustrated* (1864); *Occasional Sermons, Reviews, and Essays* (1865). Consult an article in the *Methodist Quarterly Review* (January, 1864).

FLOYD, John Buchanan (1807–63). An American politician and Confederate leader, born at Blacksburg, Va. He graduated at the College of South Carolina in 1826, studied law, and practiced his profession at Helena, Ark., from 1836 to 1839, when he returned to his native State and continued his practice in Washington County. In 1847–49 and again in 1853 he served in the Virginia State Legislature, and in 1850 he was chosen Governor of the State, in which capacity he advocated the laying of a tax on the products of States which would not deliver up fugitive slaves owned in Virginia. President Buchanan appointed him Secretary of War in 1857. Here his extraordinary incapacity for an executive office was lost sight of in the more serious grievances arising out of his relations with the leaders of the secession movement. Early in 1858 he began a rather questionable practice of accepting drafts from a firm of government contractors in anticipation of their earnings. In December, 1860, Floyd, whose resignation had been requested by the President, retired from the cabinet. After the war began he was commissioned a brigadier general in the Confederate service, commanded in some unsuccessful operations in western Virginia, and was senior commanding officer at Fort Donelson. When it was clear that capitulation was inevitable, Floyd fled in the night, together with Pillow, his second in command, and part of their troops, and left General Buckner to surrender to General Grant. (See Fort Henry and Fort Donelson.) Two weeks later Floyd was relieved of his command. Consult: Rhodes, *History of the United States*, vol. iii (New York, 1895); Crawford, *Genesis of the Civil War* (ib., 1887); Davis, *Rise and Fall of the Confederate Government* (ib., 1881); Nicolay and Hay, *Life of Lincoln* (ib., 1890).

FLOYD, William (1734–1821). An American patriot, one of the signers of the Declaration of Independence, born at Brookhaven, Suffolk Co., N. Y. On the approach of the Revolutionary War he identified himself with the Patriot party and in September, 1774, was sent as a delegate to the first Continental Congress. He was subsequently a member of the Continental Congress from 1775 to 1777 and again from 1778 to 1783; was a State Senator from 1777 to 1788 and from 1789 to 1791 was a member of the first Congress under the Federal Constitution. In 1794 he removed to Oneida County, then on the frontier; in 1801 was a member of the State Constitutional Convention and in 1808 was again elected to the State Senate. Consult: Sketches in Dwight, *Signers of the Declaration of Independence* (last ed., New York, 1895); Sanderson, *Biography of the Signers to the Declaration of Independence* (Philadelphia, 1828); and an article in the *Magazine of American History*, vol. i (New York, 1877).

FLOYʹER, Sir John (1649–1734). An English physician and scholar, born at Lichfield, educated at Queen's College, Oxford, and knighted about 1686. He practiced medicine in Lichfield, and it was upon his advice that Dr. Johnson, when a child, was taken to be touched by Queen Anne for "the evil," scrofula. He invented the pulse watch, and his work on asthma was important, as it gives the first description of emphysema of the lungs. His works on other subjects than those mentioned include: *The Touchstone of Medicines* (1687–90); *Preternatural State of the Animal Humors* (1696); *The Sibylline Oracles* (1713); *A Vindication of the Sibylline Oracles* (1715); *Essays on the Creation and on the Mosaic System* (1717); *Medicina Geronomica* (1724); *A Comment on Forty-two Histories Described by Hippocrates in his "Epidemics"* (1726).

FLÜCKIGER, flụk'ê-gēr, Friedrich August (1828–94). A German pharmacognosist, born at Langenthal, Switzerland, and educated at Berlin, Bern, Geneva, and Heidelberg. He was president of the Swiss Association of Apothecaries from 1857 to 1866, and professor of pharmacognosy at Bern (1870–73) and Strassburg (1873–92). He was also a member of the commission appointed to revise the pharmacopœia of the German Empire (1881–88). As a writer, also, he exerted a far-reaching influence upon the development of the science with which he was so long prominently identified. Among his chief publications may be mentioned: *Pharmakognosie* *des Pflanzenreichs* (1867; 3d ed., 1891); *Grundlagen der Pharmakognosie* (2d ed., 1885); *Pharmacographia: A History of the Principal Drugs of Vegetable Origin Met with in Great Britain and British India*, with Hanbury (1875; 2d ed., 1878); *Pharmaceutische Chemie* (1879; 2d ed., 1888); *Grundriss der Pharmakognosie* (1884; 2d ed., 1894).

FLUDD, Robert (1574–1637). An English physician and mystic philosopher, born at Bearsted, Kent. He was educated at Oxford, taking the master's degree in 1598, after which he spent six years in study and travel on the Continent. Having returned to England, he studied medicine, was admitted to practice in 1606, and was elected a fellow of the College of Physicians in 1609. While on the Continent he had become interested in scientific experiments and natural philosophy and maintained a laboratory where he constructed various sorts of odd mechanisms, such as an automatic dragon and a self-playing lyre. Some of his inventions were more useful, and some writers contend that he was the original inventor of the barometer. In 1615 he became interested in the doctrines of the mysterious fraternity of the Rosicrucians (q.v.) and wrote in Latin several elaborate vindications and expositions of it. He also became a follower of Paracelsus and attempted to formulate a system of philosophy based on his teachings and setting forth the identity of physical and spiritual truth. His writings attracted the attention of Kepler, Gassendi, and Mersenne, all of whom considered them of enough importance to demand refutation. Among his published works were: *Apologia Compendiaria, Fraternitatem de Rosea Cruce Abluens* (1616); *Tractatus Apologeticus Integritatem Societatis de Rosea Cruce Defendens* (1617); *Tractatus Theologophilosophicus*, etc. (1617), a treatise in three parts, dedicated to the Rosicrucian Fraternity; *Veritatis Proscenium* (1621), a reply to Kepler; *Philosophia Sacra et Vere Christiana* (1629); *Sophiæ cum Moria Certamen*, etc. (1629), and *Summum Bonorum* (1629), both replies to Mersenne; *Doctor Fludds Answer vnto M. Foster, or the Sqvesing of Parson Fosters Sponge* (1631); *Philosophia Moysaica* (1638; Eng. ed. *Mosaicall Philosophy*, 1658). Consult Waite, *The Real History of the Rosicrucians* (London, 1887).

FLÜE, flṳ'e, Nikolaus von (1417–87). A Swiss hermit, whose real name was Löwenbrugger, born near Sächseln in the Canton of Obwalden. He fought in several Swiss wars, married, had a family, and was a man of influence. In 1467 he abandoned his family and became a hermit in a ravine of the Alps called Ranft, near Basel. In 1481, at the Diet of Stans, he saved the Confederation by his plea for union. He was beatified by Clement IX in 1669 and is the patron of the original Swiss cantons. Consult: Ming, *Der selige Eremit Nikolaus von Flüe* (Lucerne, 1861–71); Herzog, *Bruder Klaus* (Bern, 1887); Baumberger, *Der selige Nikolaus von Flüe* (Munich, 1906).

FLÜELEN, flṳ'el-ĕn (It. *Fiora*). A village in the Canton of Uri, Switzerland, near the southern end of Lake Lucerne. Pop., 1900, 969; 1910, 1084. It is an important military station of the Swiss Republic and is situated at the junction of the Axen and St. Gotthard roads. It is also connected with the more important Swiss cities by rail.

FLUELLEN, flōō-ĕl'en. A disputatious and voluble but pugnacious little officer in Shakespeare's *Henry V.* His strong Welsh accent is one of the humorous elements of the piece.

FLÜGEL, flṳ'gel, Ewald (1863–1914). A German-American philologist, son of the lexicographer, Felix Flügel (died 1904), and grandson of Johann Gottfried Flügel. He was born at Leipzig, Germany, and was educated at the University of Freiburg and at Leipzig (Ph.D., 1885), where he was privatdocent in 1888–92). In 1892 he became professor of English philology at Leland Stanford Junior University. He was president of the Pacific Coast Branch of the American Philological Association in 1901–02. Besides his contributions to philological periodicals, his publications include *Carlyle's Religiöse und Sittliche Entwickelung* (1887; Eng. trans., 1890); *Sidney's Astrophel and Defense of Poesy* (1889); *Neuenglisches Lesebuch I. (Periode Heinrichs VIII.)* (1895); *Die nordamerikanische Litteratur* (1907); and the Prolegomena to the *Chaucer Dictionary*, i (1911–13). He became editor of *Anglia* in 1889 and of the *Chaucer Lexicon* for the London Chaucer Society in 1891, and he edited *Mitteilungen Beiblatt zur Anglia* (2 vols., 1890–91).

FLÜGEL, Gustav Lebrecht (1802–70). A German Orientalist. He was born at Bautzen, Saxony, was educated in theology and philology at Leipzig, and studied Oriental languages at Vienna, and in Paris under De Sacy. From 1832 to 1850 he was a professor in an academy at Meissen. He published the text of the Koran (1833) which is in most general use in the West. Among his other works are an edition of the dictionary of Hadschi-Chalfa, with a Latin translation (1835–58; published at the expense of the London Oriental Society); *Concordantiæ Corani Arabicæ* (1842); *Mani, seine Lehren und seine Schriften* (1862); the catalogue of the Oriental manuscripts at Vienna (1865–67); and a *Geschichte der Araber* (1840).

FLÜGEL, Johann Gottfried (1788–1855). A German lexicographer, born at Barby, Saxony. He was for a time a merchant and in 1810 emigrated to America, where he made a special study of the English language. Returning to Germany in 1819, he was in 1824 appointed professor of English in the University of Leipzig. In 1838 he became American Consul at Leipzig and in later years was German representative and correspondent of many literary and scientific institutions of the United States. His reputation rests chiefly on his *Vollständiges englisch-deutsches und deutsch-englisches Wörterbuch* (1830; 3d ed., 1848). Another excellent work is *Triglotte, oder kaufmännisches Wörterbuch in drei Sprachen: deutsch, englisch und französisch* (1836–40).

FLÜGEL, Otto (1842–1914). A German philosopher, born at Lützen. He studied at Schulpforta and Halle and became pastor of the Evangelical Church at Wansleben, near Halle. He took Ziller's place as editor, with Allihn, of the *Zeitschrift für exacte Philosophie im Sinne des neueren philosophischen Realismus* and in 1894 founded, with Rein, the *Zeitschrift für Philosophie und Pädagogik.* His philosophic position supports Herbartian realism, as opposed to Neo-Kantian tenets; but in theology he holds that revelation is necessary to give certitude to the mere probabilities about a first cause, to which philosophy leads. His writings, outside of contributions to the periodicals mentioned, are: *Der Materialismus vom Standpunkte*

der atomistisch-mechanischen Naturforschung (1865); *Das Wunder und die Erkennbarkeit Gottes* (1869); *Die Probleme der Philosophie und ihre Lösungen, historisch-kritisch dargestellt* (new ed., 1906); *Die Seelenfrage* (new ed., 1902); *Die speculative Theologie der Gegenwart* (2d ed., 1888); *Ueber das Seelenleben der Thiere* (2d ed., 1886); *Das Ich und die sittliche Idee im Leben der Völker* (2d ed., 1888); *Ritschls philosophische Ansichten* (2d ed., 1892); *Die Sittenlehre Jesu* (3d ed., 1892); *Ueber die persönliche Unsterblichkeit* (2d ed., 1892); *J. F. Herbart als Philosoph* (1905); *Monismus und Theologie* (1908).

FLÜGELHORN, flụ'gel-hôrn (Ger., winghorn). The German name for instruments of the bugle family. The flügelhorn formerly used in the German army was built in the keys of E♭, D, C, B♭, and A. It is now entirely replaced by the cornet. Meyerbeer employs the flügelhorn in his *Robert le Diable.* See Bugle.

FLÜGGE, flụ'ge, Karl (1847–). A German hygienist. He was born at Hanover and studied medicine at Göttingen, Bonn, Leipzig, and Munich. He was a lecturer at Berlin from 1878 until 1883, when he was called to the chair of hygiene at the Hygienic Institute in Göttingen. In 1887 he was called to a similar position at Breslau. In 1909 he became professor of hygiene at the University of Berlin. His original researches in the departments of experimental hygiene and bacteriology have found wide recognition. In the well-known work entitled *Beiträge zur Hygiene* (1872), he discusses house sanitation, porosity, and deflement of the soil, and the food distributed in charitable institutions and hospitals. His other works include *Die Mikroorganismen* (3d ed., 1896); *Grundriss der Hygiene* (new ed., 1902); *Ueber das Absolute in den ästhetischen urteilen Langensalza* (1901). In collaboration with Koch, the celebrated bacteriologist, he became an editor of the *Zeitschrift für Hygiene* in 1886.

FLÜGGEN, flụ'gen, Gisbert (1811–59). A German genre painter, born at Cologne. He studied at the Academy of Düsseldorf and then in Munich, where he afterward resided. His manner and subjects are sufficiently indicated by his title, "the German Wilkie," and he was the first German painter to enter into the social ideas of his age. His work abounds in eighteenth-century sentimentalities, but is fair in technique and in the grouping and expression of the figures. Among his best pictures are: "Servants Surprised" (1839); "The Interrupted Marriage Contract"; "The Antechamber of a Prince" (Munich Pinakothek); "The Unlucky Gamester" (Mainz Museum); "The Legacy Hunter" (Hanover Museum); and an historical painting, "The Last Minutes of the King Frederick Augustus II of Saxony."—His son, Joseph (1842–1906), genre and historical painter, was born in Munich, and studied at the academy under his father and under Piloty. He afterward traveled in France, England, and Belgium, where he was influenced by Leys. He became professor at the Munich Academy. His best-known works include "The Flight of the Landgravine Elizabeth" (1867), and "Milton Dictating Paradise Lost."

FLUID (Lat. *fluidus*, flowing, from *fluere*, to flow, Gk. *φλύειν*, *phlyein*, to overflow). A general name applied to liquids and gases. Fluids readily assume the form of the vessel in which they are contained, a small force being usually sufficient to change the relative position of their molecules. Gases are compressible or elastic fluids, their volume depending on the pressure exerted upon them. Liquids are relatively very much less compressible; but the assumption that liquids and solids are altogether incompressible is erroneous and leads to all sorts of absurd conclusions. The term "fluids" has also been applied to hypothetical substances which were supposed to cause the phenomena of heat, magnetism, and electricity. The luminiferous ether, in which, according to modern science, the waves of light, electricity, and radiant heat are propagated, is also sometimes referred to as a fluid. See Elasticity; Hydrostatics; Matter, *Properties of Matter;* Critical Point; etc.

FLUKE (AS. *flōc*, flatfish, Icel. *flōki*, kind of halibut). In ichthyology, a name applied, more commonly in Great Britain than in the United States, to various species of flounders (q.v.). A familiar example is the Scottish bonnet fluke, or brill (*Rhombus lævis*).

FLUKE, or **FLUKE WORM.** The popular name of various trematode worms, especially those which live endoparasitically. They live as parasites of vertebrate hosts, but in their development the young stages are parasitic in mollusks (snails). The name "liver fluke" is especially applied to *Fasciola hepatica* (*Distomum hepaticum*), which is common in the biliary ducts of ruminants, particularly of sheep, in which it produces the disease called rot, often causing great mortality in flocks during wet seasons and on ill-drained lands. It is generally less than an inch in length, of an oval form, its breadth about half its length; flat, in color like the liver in which it exists. It has no eyes nor other known organs of special sense; it is hermaphrodite, and the organs of reproduction occupy a great part of its body; its anterior extremity is furnished with a sucker, and another is situated at a short distance back on the ventral surface, but the terminal sucker alone is perforated and serves as a mouth, by which bile, the food of the creature, is imbibed; the tube which proceeds from it does not, however, become a proper intestinal canal, but soon divides into two large branches and ends in minute ramifications in all parts of the body.

Large numbers of flukes are sometimes found in the liver of a single sheep and of very different sizes, but they do not multiply there, as was formerly supposed. Their eggs, indeed, are produced there in great quantity, but find their way into the outer world to begin a series of transformations which are among the most extraordinary in the whole animal kingdom. The eggs are laid by the parasites in the liver and pass out with the bile, becoming mixed with the intestinal contents and are finally expelled from the body in the fæces, hatching in summer in from three to six weeks. The larva is microscopic, club-shaped, covered with cilia, has a boring apparatus at the broad or anterior end, and is capable of moving about rapidly in water. Unless it encounters a favorable host, it seldom lives longer than a day. When an opportunity presents itself, the larva attaches to and penetrates a species of snail—*Limnæa truncatula*, in Europe; *L. humilis*, *L. oahuensis*, and *L. viator* in America. It lodges in the bottom of the pulmonary chamber, loses the cilia, becomes modified in various other ways, grows and changes into a body known as a sporocyst. Certain cells within the body of the sporocyst become arranged into five to eight masses. These become modified into embryos known as rediæ, which are cylindrical in form and provided with a digestive canal and two stumplike appendages at the posterior end. When they have reached a length of about 0.25 millimeter, they rupture the sporocyst wall, migrate through the tissues of the snail, and finally lodge, as a rule, in the liver of this host. There the redia grows to about 1½ millimeters in length. From certain cells within the body of the redia daughter redia may be formed during warm weather, but during cold weather a different kind of stage is formed, known as cercaria. As many as 10 of the former or 23 of the latter may be formed. By this process of reproduction in the snail a single egg may give rise to 1000 cercariæ. The cercariæ rupture the body of the mother and by migrating through the tissues finally leave the snail. The cercaria is about 3 millimeters long, is provided with two suckers, and a tail about twice as long as the body. After leaving its host it swims about for a time in the water and finally attaches itself to a plant and encysts, and the tail disappears. When the cyst is ingested and reaches the stomach of a host, the cyst is dissolved, and the parasite becomes free and migrates to the liver, probably by way of the bile duct.

The group contains a great number of species, infesting in their mature state different kinds of animals, and finding their appropriate place in very different parts of the animal body.

Instances have occurred of the presence of *Fasciola hepatica* and two other species in the human liver and vena portæ; but their influence on the system is unknown; a species of much elongated form, *Schistosomum* (*Gynæcophorus*) *hæmatobium*, is very common in Egypt, infesting the vena portæ of man and the walls of the urinary bladder, and producing local and afterward general disease; several species have been found in the human eye, but probably through some such accident as in another case has led to the occurrence of the common fluke under the skin of the foot, where it caused a sore. Of all the known species, the Egyptian (*Schistosomum hæmatobium*) is by far the most harmful to the human body. This species is also remarkable in not being hermaphrodite and in the extreme dissimilarity of the male and female; the female being a threadlike worm, for which a lodgment is provided in a furrow on the ventral surface of the male. See TREMATODA; LIVER ROT.

FLUME (from OF. *flum*, river, from Lat. *flumen*, stream, from *fluere*, to flow). An artificial channel used to convey water for power development, hydraulic mining, and irrigation where an unlined canal is not feasible or a depression must be crossed and a siphon is not practicable. It is most commonly of wood, but may be of steel, while latterly reinforced-concrete construction has been used, especially by the United States Reclamation Service in its irrigation projects. A flume is placed aboveground, often on trestles or other elevated supports to keep it in a nearly level position. See IRRIGATION.

FLUORESCEIN. See COAL-TAR COLORS.

FLU'ORES'CENCE (named from fluor spar, which possesses this property). When ether waves are absorbed by a body which they have entered, their energy, as a rule, is distributed throughout the minute particles of the body, and some heat effect is produced, generally rise in temperature. As a result of this, the body will now radiate more energy than before, and in so doing will give out waves in the ether which are called heat waves, i.e., their wave length is long. Thus, a piece of red glass absorbs certain ether waves, among them all the visible ones except those which combine to produce the sensation red in the human eye. The temperature of the glass rises, and it emits ether waves which are too long to affect the sense of sight. There are many bodies, however, in which the energy of the absorbed waves is not spent in producing rise in temperature, and the consequent emission of long heat waves, but is spent in producing the emission of ether waves which are short enough to affect the sense of sight. Thus, if the extremely short ether waves which do not affect our eyes, and which are called the ultra-violet rays, or if the shorter visible rays, e.g., the violet and blue ones, are absorbed by the body, and if, in return for the energy thus absorbed, longer visible rays, such as those in the green, yellow, or red, are emitted, the bodies are said to "fluoresce," and the entire phenomenon is called "fluorescence." This was first observed by Sir David Brewster for an alcoholic solution of chlorophyll. He found that when a beam of sunlight was passed through such a chlorophyll solution the path of the beam was marked by a brilliant red light, although the colors which were absorbed by the chlorophyll were the blue, yellow, and orange. It should be noted here that the fluorescent light, viz., the red color, corresponds to a wave length which is longer than that of the absorbed colors. This same phenomenon was observed by Herschel in the case of a dilute solution of sulphate of quinine. If a beam of sunlight falls upon this liquid, the portions of the surface where the light is incident exhibit a bright blue color, which is confined to the surface layer.

Herschel also observed that if a beam of sunlight, after passing through a cell containing sulphate of quinine, is transmitted through a second cell of the same solution, there will be no fluorescence in the latter. This means that that constituent of sunlight which developed the blue fluorescent color in the first solution was entirely absorbed by it, and that therefore the transmitted light contained no waves which were able to excite fluorescence in the second cell. The property is exhibited in a greater or less degree by a great many substances, including ivory, bone, some kinds of paper, etc. The fact that it is seen in many violet and green varieties of "fluor spar" suggested to Sir G. G. Stokes the name "fluorescence" itself. The law announced by him and called by his name, viz., that the fluorescent light is of longer wave length than that of the absorbed light, is found to be true in general, but in some cases it has been shown that the spectrum of the absorbed and the fluorescent light overlap. This overlapping probably exists to some extent in most cases, but the more intense part of the fluorescent spectrum consists of light whose wave length is greater than that of the absorbed light. Fluorescence is shown most vividly by so-called canary glass, which is glass colored with oxide of uranium; in most kinds of paraffin oil, and by solutions made from the bark of the horse-chestnut tree.

It is thus evident that fluorescence offers a method for the study of ultra-violet spectra, because if, e.g., the solar spectrum be allowed to fall upon a screen which is moistened with some fluorescent substance, the positions of the "Fraunhofer lines" will be conspicuous by the fact that there is no light emitted at those places, whereas other portions of the screen where light is being absorbed will fluoresce.

Almost all fluorescent bodies cease to emit light the instant the incident light is stopped; but others, notably the sulphides of barium, strontium, and calcium, continue to emit their fluorescent waves for some time after the incident light has been cut off. Such bodies are called "phosphorescent," and the phenomenon is called "phosphorescence." It should be carefully noted that this has nothing whatever to do with the ordinary luminosity of phosphorus itself, which is due to its slow oxidation. Consult Preston, *Theory of Light* (London, 1901), and Wood, *Physical Optics* (New York, 1911). See LIGHT; PHOSPHORESCENCE.

FLUORES'CIN. A colorless, amorphous reduction product of fluorescein, having the chemical formula $C_{20}H_{14}O_5$. On account of its neutral quality and green fluorescence it has been used to study the movements of the intraocular fluids. It has recently been applied in keratitis and ulceration of the cornea to define the precise outlines of the lesion and render minute ulcers visible. For this purpose it is employed in 2 per cent solution with 3½ per cent of carbonate of sodium.

FLUORIDES, flo͞o'or-īdz (from *fluor*). The salts of hydrofluoric acid. See FLUORINE.

FLU'ORINE (from *fluor*). A univalent nonmetallic chemical element, one of the so-called halogens. Its elementary nature was first recognized by Davy, although it was as yet unknown in the free state and remained unknown until 1886, when Moissan succeeded in isolating it from hydrofluoric acid by a process of electrolysis, the anhydrous acid having been made a conductor of electricity by the addition of a certain amount of acid potassium fluoride. Originally Moissan used vessels of platinum, but the operation can be equally well conducted in vessels of copper. Fluorine occurs combined as fluorite, a calcium fluoride; as cryolite, an aluminum-sodium fluoride; and, in smaller quantities, in many other minerals, as apatite, fluocerite, topaz, wagnerite, wavellite, yttrocerite; also in sea water, mineral springs, and rivers, as well as in the stems of grasses, and in bones and other animal substances.

Fluorine (symbol, F; atomic weight, 19.0) is a light, greenish-yellow gas of a penetrating and disagreeable odor that has an irritating effect on the eyes and on mucous membranes. It decomposes water, forming hydrofluoric acid with its hydrogen and setting free ozonized oxygen. Antimony, arsenic, boron, iodine, silicon, and sulphur are capable of burning in an atmosphere of fluorine, and many organic substances, such as alcohol, when brought in contact with it, take fire. Hydrogen combines with it, even in the dark, forming the well-known hydrofluoric acid. Even within 20° C. of the absolute zero of temperature, hydrogen (liquid) combines with fluorine (solid) with explosive violence. The liquefaction of fluorine may be effected by passing the gas into a tube surrounded with boiling liquid air. Under ordinary atmospheric pressure liquid fluorine boils at about 185° C. below the freezing point of water. The powerful oxidizing properties of fluorine would probably be utilized industrially if its production were not so difficult.

Hydrofluoric acid (HF) is prepared by gently heating one part of pure fluorite with about twice its weight of sulphuric acid in a leaden retort, the anhydrous acid thus produced being condensed in a receiver surrounded by a freezing mixture. It is a colorless, mobile liquid that boils at 19.4° C. (67° F.), and solidifies to a white crystalline transparent mass which melts at −92.3° C. (−134.1° F.), and has a powerful corrosive action on organic tissues, producing severe burns on the skin. For commercial use the acid is made by passing the anhydrous vapor directly into a leaden receiver containing water and is then obtained in dilute form. Owing to its corrosive nature, it must be preserved in lead, gutta-percha, or ceresin bottles. The aqueous acid has the property of dissolving glass and is therefore extensively used for etching on glass, e.g., in marking the divisions on a thermometer tube. Unlike hydrochloric, hydrobromic, and hydroiodic acids, hydrofluoric acid exists in ordinary aqueous solutions in the form of double molecules, as if its formula were, not HF, but H_2F_2.

Other compounds of fluorine include *hydrofluosilicic acid,* which is prepared by heating a mixture of sulphuric acid, fluorite, and silica (sand or powdered glass), and passing the gaseous silicon fluoride into water. It does not attack glass directly, but on heating it decomposes with formation of free hydrofluoric acid, and this attacks the silica of the glass; hence its application for etching. Hydrofluosilicic acid combines with bases to form salts called *fluosilicates* or *silicofluorides,* of which the most important are those of potassium and sodium. Certain compounds of fluorine have valuable antiseptic properties, and a solution containing 0.61 of ammonium fluosilicate has been used as a wash for wounds. Fluorine compounds may also be employed for preserving food without communicating any taste to it.

FLU'ORITE (from *fluor*), or FLUOR SPAR. A calcium fluoride that crystallizes in the isometric system. It is found both massive and crystallized, and may be white, yellow, green, red, blue, or brown in color, sometimes showing a bluish fluorescence. Varieties of fluorite having different colors have been called *false amethyst, emerald, ruby, topaz,* etc. When heated, certain varieties become phosphorescent. Fluorite occurs in Cumberland and Derbyshire, England (where fine-colored specimens called *Derbyshire spar* are found), in Norway, Saxony, and Switzerland. In the United States crystallized varieties have been found in St. Lawrence Co., N. Y.; Hardin Co., Ill.; near St. Louis, Mo., Pike's Peak, Colo., and in the Lake Superior region. Fine transparent specimens have been carved into vases and other similar ornaments, and in such forms fluorite was highly prized by the ancients. Commercial fluorite is obtained in Caldwell, Crittenden, and Livingston counties, Ky.; from near Rosiclare, Ill.; and in Yuma Co., Ariz. It is used as a source of hydrofluoric acid, which is employed for etching on glass, in the manufacture of opalescent glass, and as a flux in iron smelting. In 1912 the production in the United States amounted to 123,387 short tons, having a total value at the mines of $876,337. A dark-blue Bavarian variety of fluorite, called *antizonite*, gives off a strong odor that produces headache and vomiting, said to be due to the liberation of pure fluorine.

FLUOROSCOPE, flōō-ŏr'ō-skōp (from Eng. *fluorescence* + *σκοπεῖν*, *skopein*, to look). A screen coated with some fluorescent material such as calcium tungstate or barium platinocyanide, into which the observer looks to see the shadows cast by the Roentgen rays.

FLUOR SPAR. See Fluorite.

FLÜRSCHEIM, flụr'shīm, Michael (1844–1912). A German agitator of land reform, born in Frankfort-on-the-Main. He lived in the United States from 1867 to 1872. Upon his return to Germany he founded the ironworks at Gaggenau, Baden, and in 1892 made his home at Castagnola, near Lugano, Switzerland. He aims to show that the revenues accruing to the individual owner from taxes and ground rent are the primary cause of the accumulation of vast fortunes by the few and of the indigence and suffering of the masses, and that the control of land by the state would remove this evil and would at the same time counteract the evils of socialism. The following maintain the advantages of individualism and are a few of his principal works: *Auf friedlichem Wege* (1884; frequently reprinted); *Deutschland in hundert Jahren* (2d ed., 1890); *Der einzige Rettungsweg* (rev. ed., 1890); *Rent, Interest, and Wages* (1891); *Clue to the Economic Labyrinth* (1902); *The Economic and Social Problem* (1909).

FLUSH'ING (Dutch *Vlissingen*). A seaport of the Netherlands, situated on the south coast of the island of Walcheren, at the mouth of the western Scheldt (Map: Netherlands, B 3). It was formerly an important fortress and naval station of the Netherlands. Since 1873 it has been transformed into a trading centre, but it is still strongly fortified and commands the entrance to the Scheldt. The port has a large trade in petroleum, wood, and coal, chiefly with England and India. It has an academy of sciences and a school of navigation. The chief industries are shipbuilding and the manufacture of machinery and tobacco and there is a branch of the Krupp gunworks, Essen, Germany, here. The town exports agricultural products. Flushing is the seat of a United States consular agent. A daily service by steamers is carried on with Queenborough, England, which, connecting with the railway at Flushing, is a main artery of eastern Europe. Pop., 1900, 18,893; 1910, 21,807. Flushing is the birthplace of Admiral de Ruyter, and the poet Jacob Bellamy. It was stormed and taken by the English in the Walcheren expedition under Lord Chatham in 1809.

FLUSH'ING. Formerly a village, but in 1908 included in the Borough of Queens, New York City (Map: Greater New York, G 5). It is on the Long Island Railroad, and on Flushing Creek, and has trolley connection with New York. The township was settled in 1643 and the village about two years later, both being called at first Vlissingen, of which the present name is a corruption. About 1660 the population became predominantly Quakers. Flushing is the seat of St. Joseph's Orphanage, the New York Parental School, and a new high school. It has a Carnegie library, nurseries, and manufactories of chicory, motion picture films, electric signs, chemicals and asphalt. Consult H. D. Waller, *History of the Town of Flushing* (Flushing, 1899).

FLUTE (OF. *fleüte*, *flaüte*, It. *flauto*, from OF. *flaüter*, to play the flute, from Lat. *flatus*, blast, from *flare*, to blow; connected with OHG. *blâjan*, Ger. *blähen*, AS. *blâwan*, Eng. *blow*). One of the oldest wind instruments, well known to the ancient Greeks and Hebrews. It has a soft and pleasant quality of tone, is an important instrument in orchestral music, and, in consequence of its easy treatment, is much in favor with amateurs. The flute is commonly made of boxwood or ebony, but sometimes of ivory or silver. Its form is that of a taper tube, made in four pieces, with six holes for the fingers, and with from 1 to 14 keys, which cover or open other holes. The sound is produced by blowing into the embouchure, an oval kind of hole at one side of the thick end, so that the air in its passage from the mouth is broken against the opposite edge of the hole, which causes the column of air inside the tube to vibrate. The notes of the gamut are produced by the opening or shutting of the holes by the fingers of both hands. The compass of the flute is from b to c^4.

In the modern orchestra there are always two and often three flutes. When three are required, the third flute is generally the small flute, or *piccolo* (q.v.). Its tones are very shrill and can be employed effectively only in *fortissimo* passages. Before Böhm (q.v.) had perfected the modern flute the *flûte à bec* was used extensively. This instrument had a mouthpiece like the clarinet and was played in a vertical position. (See Flageolet.) If in scores written before the middle of the eighteenth century the name *flauto* occurs, it is always the flûte à bec that is meant. Consult: Th. Böhm, *Ueber den Flötenbau und die neuesten Verbesserungen desselben* (Mainz, 1847; in English by W. S. Broadwood, London, 1882); id., *Flute and Flute Playing*, trans. by Miller (Cleveland, 1908); Ch. Welch, *History of the Böhm Flute* (3d ed., London, 1896); P. Alexeieff, *Historisches über Flöte und Flötenspiel* (Riga, 1911); H. M. Fitzgibbon, *Story of the Flute* (New York, 1914).

FLUTE BIRD (so called from its clear note). An Australian shrike (*Gymnorhina tibicen*). See Piping Crow.

FLUTEMOUTH. See Snipefish.

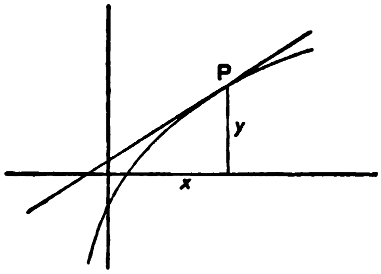
FLUTE SHRIKE. One of the brightly colored African shrikes of the genus *Laniarius*, so called from the clear whistle uttered by all of the species, one of which is locally called "canariebyter" because it preys upon certain small birds locally known as canaries.

FLUTING. The moldings in the form of hollows or channels cut vertically on the surface of columns. They were adopted by the Greeks as ornaments to their Doric, Ionic, and Corinthian columns, and were retained by the Romans in their architecture. The Tuscan is the only style without flutes. In Doric there are usually 20 shallow flutes on the circumference, and the curves meet with a sharp edge. The channels are so placed that one comes directly under the middle of each face of the capital. These curves, in Greek Doric, are elliptical, and they are carried up across the necking to the base of the cap. In the other styles there are regularly 24 flutes on the circumference, deeper than those on the Doric column. These are semicircular and are separated by a vertical band and, before reaching the necking and the base, are terminated with semicircular top and bottom. Flutes are said to be cabled when they are filled in to about one-third of their height from the base with a convex bead. This is done to strengthen the column and protect the flutes. In countries where Roman remains were abundant, as in the south of France, fluting was sometimes adopted by the early mediæval architects, as at Arles and Autun. In Italy, also, traces of this decoration are visible during the Middle Ages; but the flutes soon ceased to be vertical and in Romanesque architecture assumed many varieties of forms, such as curves, zigzags, etc., twisting round the shafts. See Column.

FLUX (OF. *flux*, from Lat. *fluxus*, a flow, from *fluere*, to flow). The material added to ores or furnace charges preliminary to melting in order to separate the extraneous matters which by their combination with the flux produce fluid compounds. Fluxes may be either acid, such as silica, or basic, such as limestone. In the smelting of the iron ores the common flux is limestone, which combines with the silica and alumina to form a fluid slag. In the melting and refining of gold and silver bullion borax and various mixtures of borax, soda, and potash, are used to eliminate the oxides of the base metals. Fluor spar is sometimes used as a special flux to hold in suspension nonfusible oxides. Lead oxide is an important basic flux, used in assaying gold-silver ores. The name "white flux" is applied to a mixture of the carbonate and nitrate of sodium or potassium. "Black flux" is prepared by heating in close vessels ordinary cream of tartar (bitartrate of potassium) with half its weight of potassium nitrate, when an intimate mixture of finely divided charcoal and potassium carbonate is obtained. The latter flux, when mixed with finely divided metallic ores, and the whole raised to a high temperature in a furnace, is not only useful in removing the silica, which the potassium carbonate it contains enables it to do, but the charcoal withdraws the oxygen from the metallic oxide and causes the separation of the pure metal. See Iron and Steel, Metallurgy of; Copper; Lead; Assaying.

FLUX, or Profluvium. A discharge, generally from a mucous membrane. This old term was applied to all abnormal fluid evacuations from the body, but especially to those from the bowels and from the uterus. Dysentery (q.v.) was long termed "the bloody flux," to distinguish it from simple diarrhœa. See also Diarrhœa; Menstruation.

FLUXIONS. The name "method of fluxions" was given by Sir Isaac Newton to his calculus and was generally employed in England and America until well along in the nineteenth century. The name, the symbolism, and the fundamental idea upon which the method rests, were then supplanted by those of the Leibnitz calculus. Newton defined a "fluent" as a quantity considered as gradually and indefinitely increasing (flowing, fluxing), and added: "The velocities at which these fluents move I call fluxions"—"*Quas Velocitates appello Fluxiones, aut simpliciter Velocitates vel Celeritates.*" (Colson edition, London, 1736, vol. i, p. 54.) Briefly, his plan was this: Consider a curve described by a moving point $P = (x, y)$, and let the rate at which x increases (flows, fluxes) be designated by $\dot{x}$, and be called the fluxion of x. In the same way let $\dot{y}$ be called the fluxion of y. Then $\frac{\dot{y}}{\dot{x}}$ is the tangent of the angle made by the tangent to the curve at P, with the x-axis. It is therefore seen that $\frac{\dot{y}}{\dot{x}}$ is merely the $\frac{dy}{dx}$ of the Leibnitz calculus. The fundamental objection to the principle is that it is based upon the idea of velocity, which involves that of time. To this objection must be added that of the notation employed by Newton. While this has some advantages in certain problems in physics and also in presenting the first ideas of the calculus, it becomes unwieldy when one desires to express successive differentiations. The method of fluxions was used by Newton as early as 1666 and is found in the manuscript of his *De Analysi per Æquationes Numero Terminorum Infinitas*, which was circulated among his students in 1669, and in the *Methodus Fluxionum et Serierum Infinitarum*, which he wrote about 1675. The term "fluxion" seems to have been suggested to him by Cavalieri's work. Consult Raphson, *The History of Fluxions* (London, 1715). See Calculus; Newton.



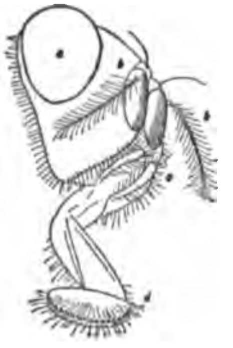
FLUXION.

FLUXION TEXTURE. See Igneous Rocks.

FLUX OF LIGHT. See Photometry.

FLY (AS. *flēoge*, Icel. *fluga*, OHG. *flioga*, Ger. *Fliege*, from AS. *flēogan*, to fly, Icel. *fljuga*, OHG. *fliogan*, Ger. *fliegen;* ultimately, perhaps, connected with Lat. *pluma*, feather). An insect of the group which constitutes the order Diptera, a group of very great extent and of great economic importance. Members of the order are characterized mainly by having only two wings, the hind wings being so abbreviated as to be represented only by two small, slender rods known as halteres, or poisers, believed to be of service in assisting the insect to keep its balance and direction in flight. The only other insects which possess but two wings are the males of scale insects of the family Coccidæ. The mouth parts of the Diptera are fitted for sucking and piercing, but not for gnawing.

Reproduction. The flies form a very large group, comprising more than 40,000 described species, and in number of individuals it is unexcelled by any other group of insects for the prolificacy and rapid breeding of the many forms. Some curious biological phenomena occur in this group. In a great many flies, e.g., the eggs hatch within the body of the insect, and the living larvæ are deposited. With the group known as the Pupifera, even the larval development is undergone in the body of the female, and the insect is deposited in the pupal condition. The extraordinary phenomenon known as pædogenesis also occurs, and the larvæ of a certain midge are known to give birth to young while yet in the larval condition. The metamorphoses of dipterous insects are more complete than those of any other order of insects. The larva is commonly termed a grub, or maggot, and is footless and frequently almost structureless. In many species the duration of the larval stage is very short. The maggot feeds voraciously, grows with extraordinary rapidity, and transforms to pupa either within the last larval skin or into an appendage-bearing pupa similar to that of certain Hymenoptera or Lepidoptera. The different forms vary greatly in habits. Very many are feeders on decaying animal and vegetable matter. Others are parasites on warm-blooded animals. Many forms are aquatic. Others feed upon living vegetation, while others form galls upon different plants. Among the plant-feeding flies some species have high rank as injurious insects, as the Hessian fly and the onion maggot, the apple maggot, and others, while whole regions are rendered almost uninhabitable by the presence of forms which annoy men and animals.



HEAD OF A FLY.

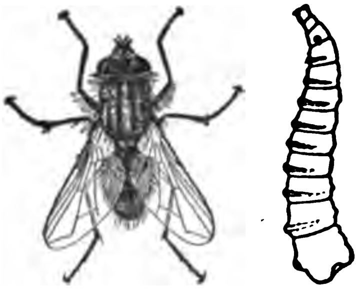
Musca vomitoria: a, eye; *b*, antennæ; *c*, maxillary palpi; *d*, labium or "proboscis."

Habits and Economy. Adult flies vary greatly in structure and in habits. With some the mouth parts are fitted for piercing the skin of warm-blooded animals—the mosquitoes and the gadflies, e.g., are especial torments of men and animals. The discovery that certain dipterous insects are important factors in the transfer of disease has rendered them the subject of special study of late years. The function of certain mosquitoes in the transfer of yellow fever and malaria, the transfer of anthrax by certain gadflies, the carriage of the germs of an African fever by the tsetse fly, the conveying of the germs of the purulent ophthalmia of the Egyptians and Fiji Islanders by the house fly, the transfer of the germs of typhoid fever and cholera by flies, and the spread of the disease known as pinkeye in the Southern States by midges, are all instances of this maleficent function. Detailed information may be found in Howard, *Carriage of Disease by Flies* (Agricultural Department, Washington, 1901); Doane, *Insects and Disease* (New York, 1910). See INSECTS, PROPAGATION OF DISEASES BY.

On the other hand, the Diptera do perform, in many cases, beneficent services to their fellow creatures. Many forms frequent flowers and are important agencies in the cross-fertilization of plants. See FLOWERS AND INSECTS.

Edible Flies. That flies should furnish human food is one of the most curious features of their history. Small species of the genus *Ephydra*, allied to the horseflies, inhabit some alkaline lakes of the western United States and Mexico in enormous swarms. Such is the case in Lake Mono, Cal., whose water is so dense with salts that no fish or amphibian can live in it. The *Ephydra* flies resort there in countless swarms, dropping their eggs, and the larvæ develop so numerously that they drift in heaps along the shore and at the proper season used to be gathered for food by the Indians, who would come long distances for the purpose. The grubs were dried in the sun on blankets and then rubbed in the hands to remove the shell, when there remained a yellowish kernel like a grain of rice, which was ground fine and baked into cakes. This food, called *koo-chah-bee*, is oily, nutritious, and not unpleasant in taste. The species is *Ephydra californica*. A similar preparation, under the name of *ahuatle*, is made from the eggs of *Ephydra hians* in Mexico. These eggs are laid on sedges, which the natives about Lake Texcuco purposely set afloat. The sedges are then collected and beaten over a cloth, knocking the eggs off, which are then cleaned and ground into flour. The larvæ of these flies are also eaten under the name of *puxi*.

Classification. The difficulties in the systematic study of the Diptera are very great, and in many groups the species or number of families have not been well worked up, on account of the difficulty of preserving specimens, since they are so slender and fragile. It is probable that not more than a quarter of the species in existence have been named and classified, and Dr. Howard estimates that the order includes no less than 350,000 species. The latest comprehensive study in this direction has been made by M. D. Coquillett, of the United States Department of Agriculture, who divides the order into two suborders:



HOUSE FLY.

The adult house fly (*Musca domestica*) and its full-grown larva.

I. *Eproboscidea*, embracing only the parasitic pupiparous families Hippoboscidæ (see FOREST FLY) and Nycteribiidæ (bat ticks), whose proboscis is never furnished with terminal lips; and

II. *Probosoidea*, embracing all other flies never parasitic on mammals, birds, or honeybees, and having the proboscis terminating in lips and oviparous or larviparous.

In the suborder Proboscidea he finds two sections—(1) Orthorhapha and (2) Cyclorhapha. In the first are placed such slender, elongated, often long-legged groups as the crane flies, midges, mosquitoes, moth flies, snipe flies, and gnats, together with the more robust families of March flies, gadflies, bee flies, robber flies, and their immediate allies. In the second section will fall the syrphus flies, the botflies, Tachina flies, flesh flies, house flies (q.v.), dung flies, fruit and gall flies, and several groups of small forms closely related thereto.

Fossil Flies. Fossil flies or Diptera are less common than are representatives of the Coleoptera and Orthoptera, but more frequent than other insects. They appear first in the Liassic rocks and continue through the Jurassic and Cretaceous; but the remains in these formations are usually poorly preserved. The Tertiary Diptera represent nearly all the modern families; those of the Tipulidæ (crane flies), Bibionidæ (March flies), and Syrphidæ are most common. The amber of the Baltic region and the shales of Oeningen, Germany, are especially rich in dipteran fossils, and those found in the amber are usually beautifully preserved. In North America the shale beds at Florissant, Colo., are the most prolific sources and have yielded more than 1500 specimens of Bibionidæ alone. None of the fossil Diptera present any striking departures from the modern types. Consult Scudder, "Systematic Review of our Present Knowledge of Fossil Insects," in *Bulletin 31, Geological Survey* (Washington, 1886). See INSECT.

Bibliography. Williston, *Standard Natural History,* vol. ii (Boston, 1884); id., *Manual of . . . North American Diptera* (New Haven, 1896); Knobel, *Mosquitoes, Gnats, Crane Flies, Midges, and Flies of the Northern States* (Boston, 1897); Osten-Sacken, *Catalogue of the Described Diptera of North America* (2d ed., Smithsonian Institution, Washington, 1878); Kellogg, *American Insects* (New York, 1908); Fabre, *The Life of the Fly* (trans. by A. T. de Mattas, ib., 1913); Ross, *The Reduction of Domestic Flies* (Philadelphia, 1913). Consult also general works mentioned under INSECT, and special books and papers mentioned under such special articles as BOT; FLESH FLY; FRUIT FLY; GADFLY; GALL GNAT; GNAT; HESSIAN FLY; HOUSE FLY; MOSQUITO; ROBBER FLY; ETC.

FLY. A river of New Guinea, rising at the base of the Victor Emmanuel Mountains, in the British portion of the island, and flowing first southwest and then southeast, emptying into the Gulf of Papua (Map: Australasia, G 3). For a portion of its course it marks the boundary between British and Dutch New Guinea. Its two main tributaries are the Alice and Strickland rivers. The banks are covered with mangrove trees, and at its mouth there is a wide delta. Its course is about 620 miles from the sea to the British-German boundary, and it is navigable by steam launch for over 500 miles.

FLY AG'ARIC. See AMANITA; FUNGI, EDIBLE AND POISONOUS.

FLY AMANITA. See AMANITA.

FLY CASTING. Of the three main methods of angling, casting the fly is the most scientific and universal. In the United States its devotees are divided into two schools—the old-time, or "wet-fly," anglers, who whip the stream with a cast of flies and shift from place to place; and a new school of "dry-fly" anglers, so called because they use but one very small fly on their line, and that constructed with upright wings, so that when it drops on the water it remains dry and natural, and is permitted to float with the current, instead of being trailed against it, as the wet fly is. Both schools use in common a light, elastic, three-jointed rod, from 9 to 10 feet long, varying in weight according to the skill of the angler or the use to which it is to be put, from 3½ ounces upward. The line for trout is of waterproof silk, braided, of size F or G (the heavier being more easily cast); at the end of the line is attached a *leader,* made of single strands of clean, round, silkworm gut; to this is tied the fly, or two or three, according to the method of the angler. Leaders may be stained a neutral tint by soaking in a strong solution of green tea and kept between layers of damp felt. Before use they should be softened in water, or the gut may crack and become worthless. Beneath the rod, at the extreme end of the butt, should be fixed a click reel, preferably of the multiplying type. Casting the fly involves many intricate movements, to be perfected only by long practice. An expert in this beautiful art will handle accurately from 100 to 115 feet of line with a five-ounce rod, or 150-odd feet with a large salmon rod. Consult Gill, *Practical Dry-Fly Fishing* (New York, 1912) and *Dry-Fly Man's Handbook* (ib., 1913). See FISHING; SALMON FISHING; TROUT FISHING.

FLYCATCHER. 1. A name given to various birds of the order Passeres, but originally applied to those of the thrushlike family Muscicapidæ, having a moderately long, angular bill, broad and depressed at the base, compressed and slightly curved at the point; the base surrounded with stiff hairs or bristles directed forward, which help to secure insect prey. The legs and feet are small; the outer toe the longest and attached to the middle one as far as the first joint. The wings are not long; their first quill feather is very short; the third is the longest. The birds of this family, as now restricted, are exclusively confined to the Old World and mostly to the warmer parts of it. The true flycatchers all have the habit of remaining perched for a long time in the same spot, only leaving it to make a sudden dart at a passing insect, which is seized with a snap of the bill, and then returning. They are almost never to be seen running on the ground, or even on the branches of trees, and do not chase insects in the air like swallows. Even in the restricted use of the name the Muscicapidæ include about 700 species, arranged in nearly 100 genera. Only four species are European, two of which are British—the spotted flycatcher (*Muscicapa striata,* or *grisola*) and the pied flycatcher (*Muscicapa hypoleuca,* or *atricapilla*)—birds about the size of a sparrow, the former of which is common in most parts of England as a summer bird of passage, but rare in Scotland; the latter is rare in Great Britain, although abundant in the south of Europe. The spotted flycatcher is brownish gray above, white beneath, the head and breast marked with dusky spots. Its call is a mere chirp. It is remarkable for the choice it makes of situations for its nest, often on a beam in an outhouse, on the side of a fagot stack, on the branch of a tree trained against a building, and sometimes even on a lamp-post in a street. It has been observed that a single pair of spotted flycatchers feed their young no fewer than 537 times in one day, and that their motions are so rapid that, to count the number of visits accurately, the observer must not take his eye off the nest for a moment.

2. The name "flycatcher" is often extended to birds of similar habits belonging to other families. In America the name is universally applied to the birds of the family Tyrannidæ, often styled "tyrant flycatchers." This family is peculiar to America and contains some 500 or 600 species, of which less than 40 occur in the United States. They are more or less solitary and sedentary in their habits and feed like the true flycatchers. The shape of the wings and tail enables these birds to twist and turn in the air with remarkable agility and grace. The flycatchers, being entirely insectivorous, are necessarily migratory in most parts of the United States. They have no power of song, but their notes are characteristic and in some species not unmusical. The colors are generally dull, though some of the tropical forms

offer striking exceptions. Among the numerous remarkable birds of this family can be mentioned only a few genera: *Tyrannulus*, notable for the diminutive size, the type species being less than 3 inches long; it is found in northern South America. *Todirostrum*, small, very brightly colored South American species, with a bill like that of a tody (q.v.). *Fluvicola*, small black and white birds of the South American pampas, called water caps, because of their fondness for water. *Pitangus*, the large derby flycatchers of Mexico, nearly a foot long. *Milvulus*, the graceful and striking swallow-tailed flycatchers, in which the tail is very long and deeply forked, as in the barn swallow; they are found in tropical America, but one species is common in the southern United States, especially Texas. Among the common flycatchers of the eastern United States may be mentioned the kingbird (q.v.); the least flycatcher (*Empidonax minimus*), called "chebec," from its characteristic note; the small green Acadian and Traill's flycatcher, or "pewees"; the olive-sided flycatcher (*Nuttallornis, or Contopus, borealis*), a very solitary but noisy woodland species, nowhere very common; and the great-crested flycatcher (*Myiarchus crinitus*), a handsome woodland species with a loud and very characteristic note. See Kingbird; Pewee; Phœbe; Scissor-tailed Flycatcher; Plate of Flycatchers; Plate of Eggs of Song Birds.

FLYING BOAT. See Aëronautics.

FLYING BRIDGE. See Ferry.

FLYING COLUMN. Usually a small army of cavalry and infantry and, where possible, horse artillery, complete in itself and carrying its own principal supplies. It is organized for rapidity of movement, freedom from all unnecessary impedimenta, and is comparatively independent of its original base of operations. It is generally used for imperative purposes, as the securing of strategical points, the relief of garrisons in extremities, or to circumvent some countermove of the enemy. The most important instance of modern times was the flying column of British troops, organized after Maiwand, under General (now Field Marshal, Earl) Roberts, who marched 300 miles in 20 days, fighting a decisive battle at the end of the march. The march was commenced on Aug. 9, 1880, at Kabul, and carried out through a mountainous and hostile country.

FLYING DRAGON, or FLYING LIZARD. See Dragon.

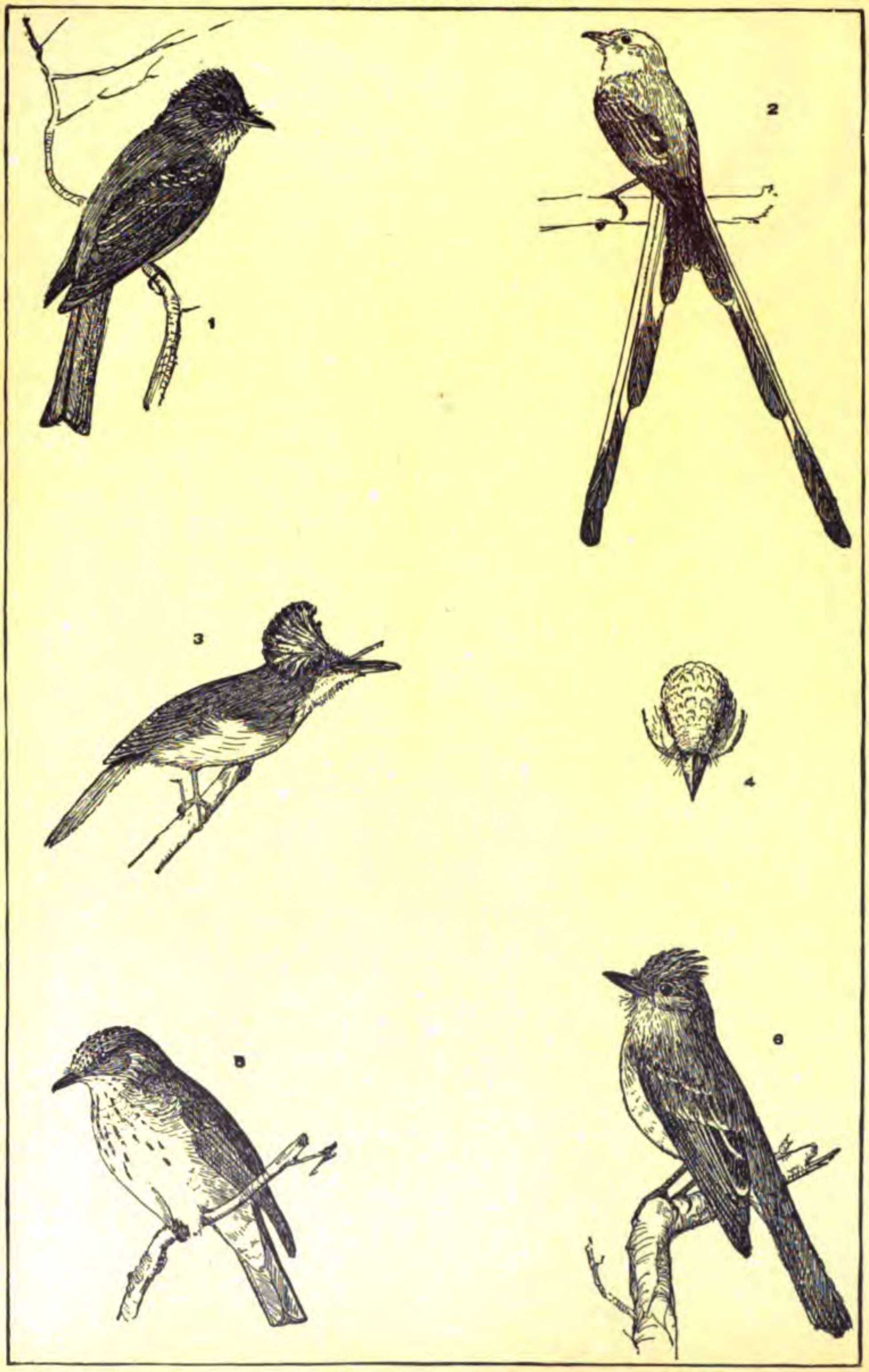
FLYING DUTCHMAN. According to the legend, the shade of the Dutch sea captain Van Straaten, condemned for his sins to sail the high seas in a spectral ship, the sight of which is a bad omen to sailors, who quickly change their course to avoid its fatal influence. The legend has its prototype in many tales of the German mythology, and similar stories are current in other countries. In England Vanderdecken is the name of the captain, and the phantom ship is the exact image of a real vessel. It is related that originally he was delayed by head winds while trying to turn the Cape of Good Hope and blasphemously swore that he would beat around the cape if it took till Judgment Day. When seen in those waters, his vessel may be recognized by the fact that it comes up against a head wind with all sails set. This legend forms the subject of Wagner's opera *Der Fliegende Holländer* (q.v.).

FLYING FISH. A name given to all those fishes which have the pectoral fins so very large that by means of them they are sustained in short seeming flights in the air. These fishes belong to two very different families—Exocœtidæ and Cephalacanthidæ; but the name "flying fish" is sometimes limited to those of the former family, those of the latter being known as *flying gurnards*. (See Flying Gurnard.) The true flying fish of the genus *Exocœtus*, in which the pectoral fins are nearly as long as the body, are numerous in species and occur in most parts of the oceanic world. The one best known is that of the North Atlantic (*Exocœtus volitans*), which occurs abundantly in the open seas, is found on the coast of South Europe, and is not uncommon on the Atlantic coast of North America; it is also found near the Hawaiian Islands. It is dark brown, with an oblique whitish band from the axil back to the middle of the fin. (See Plate of Needle Fish.) Another common species of the Atlantic is *Exocœtus furcatus*, having about the same range as the above. The great flying fish (*Exocœtus californicus*), common on the California coast, attains a length of 18 inches. The other species range from 6 to 12 inches in length. A somewhat different one is the sharp-nosed flying fish (*Fodiator acutus*), common on both sides of Central America. All these are good food fishes, and the favorite food of many predatory fishes, such as bluefish, albacore, porpoises, etc., to escape which their flights are undertaken. Birds often seize them in the air, and they frequently leap on board boats and small ships.

Close observations of their method of flight have been made by Jordan and his assistants, Gilbert and Evermann, a summary of which is given in *Fishes of North America* (Washington, 1883), as follows: The flying fishes live in the open sea, swimming in large schools. They will "fly" a distance of from a few rods to more than an eighth of a mile, rarely rising more than three or four feet. Their movements in the water are extremely rapid; the sole source of motive power is the action of the strong tail while in the water. No force is acquired while the fish is in the air. On rising from the water the movements of the tail are continued until the whole body is out of the water. While the tail is in motion, the pectorals seem to be in a state of rapid vibration, but this is apparent only, due to the resistance of the air to the motions of the animal. While the tail is in the water, the ventrals are folded. When the action of the tail ceases, the pectorals and ventrals are spread and held at rest. They are not used as wings, but act rather as parachutes to hold the body in the air. When the fish begins to fall, the tail touches the water, when its motion again begins, and with it the apparent motion of the pectorals. It is thus enabled to resume its flight, which it finishes finally with a splash. While in the air it resembles a large dragon fly. The motion is very swift, at first in a straight line, but later deflected into a curve. The motion at first has no relation to the direction of the wind, but when in full flight the fish veers around and scales along with the wind. When a vessel is passing through a school of these fishes, they spring up before it, moving in all directions, like grasshoppers in a meadow.

For comparative descriptions of the species of flying fishes, consult Jordan and Meek, *Proceedings United States National Museum* (Washington, 1885). A very complete series of the Ameri-

TYPICAL FLYCATCHERS



1. WOOD PEWEE (Myiochanes virens).
2. SCISSOR-TAILED FLYCATCHER (Muscivora forficata).
3. CROWNED TYRANT FLYCATCHER (Muscivora mexicana).
4. BEAK OF A TYRANT FLYCATCHER (a pewee) from above, showing its breadth and bristles.
5. SPOTTED FLYCATCHER (Muscicapa grisola).
6. GREAT-CRESTED FLYCATCHER (Myiarchus crinitus).

can forms is in the Museum of the Academy of Natural Sciences at Philadelphia. Consult Gill, *Flying Fishes and their Habits* (Washington, 1904). See Plate of Needle Fish.

FLYING, FLIGHT, Mechanical. See Aëronautics.

FLYING FOX. 1. A fox bat, or fruit-eating bat of the East. (See Fox Bat.) 2. A flying lemur. See Cobego.

FLYING FROG. A small frog, whose long toes are connected by membranes, and which makes sailing leaps from tree to tree. It belongs to the family (Ranidæ) of ordinary water frogs, but is wholly arboreal in habit and forms the genus *Rhacophorus*, characterized not only by the webbing, but by the presence of a small additional bone between the last two joints of the toes, which terminate in disks. All are normally richly green (with yellow bellies), rendering them invisible amid the foliage; and, in addition, they possess in a high degree the power of changing their color (see Metachrosis) to conform to the color of the surface they rest upon. Over 40 species are known, most of which inhabit the Malay Archipelago, Ceylon, and the adjacent shores of Asia, while 12 species are natives of Madagascar. One of the best known is the Bornean species (*Rhacophorus pardalis*), discovered by Wallace. In this the webbing between the toes is extensive, all four together covering a space of about 12 square inches, and the forelegs are bordered by a membrane. In most of the other species the webbing is less extensive, and the distance they can glide through the air is correspondingly decreased. They breed in the water, like other tree frogs, are mainly nocturnal in their movements, and the males are noisy. "The larvæ are remarkable for the possession of an adhesive disk behind the mouth on the undersurface, while the muzzle is prolonged into a proboscis, and the single breathing pore is situated on the right side of the body, nearer to the tail than to the muzzle." Consult: Wallace, *Malay Archipelago* (New York, 1898); Tennent, *Ceylon* (London, 1859).

FLYING GECK'O. A small lizard, having a parachute, enabling it to sail through the air. See Gecko, and compare with Dragon.

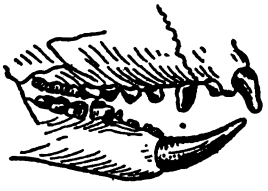
FLYING GUR'NARD, or FLYING ROBIN. A fish of the family Cephalacanthidæ allied to the gurnards or sea robins (qq.v.), but remarkably distinguished by the great size of the pectoral fins, used for the same purpose and in the same way as those of the true flying fish. The pectoral fins are, however, of a very different appearance from those of the Exocœtidæ, widening almost to the end, which is rounded, and the tips of the rays extend considerably beyond the membrane. A very long spine points backward from the gill cover on each side. The species are few in number, and all are pelagic. One (*Cephalacanthus volitans*) inhabits the middle latitudes of the North Atlantic, is usually about 12 inches in length, and has similar habits to those of the flying fish, but does not fly so well; it is often called batfish.

FLYING JIB. See Jib.

FLYING LE'MUR, or Colugo. See Cobego.

FLYING MACHINES. See Aëronautics.

FLYING PHALAN'GER, or MOUSE, or OPOSSUM. The name given to various marsupial quadrupeds of the subfamily Petaurinæ, natives of New Guinea and of Australia, where they are generally called squirrels or flying squirrels. They are nearly allied to the phalangers (q.v.), but have not so long and prehensile a tail, while they are distinguished by a hairy fold of the skin along the flanks, used as a parachute. There are several different genera, of which *Petaurista* includes the large forms, some of which are 20 inches long besides the tail, and *Acrobates* includes the smallest forms, only 3 or 4 inches long. The flying membrane extends along both fore and hind legs almost to the toes, but does not appear behind the hind legs, nor include the tail, which is pretty long and bushy, but which in some of them has a distichous character, the hair spreading out to the sides, and so rendering it useful in supporting as well as in guiding the body in the air. They are capable of modifying their course in the air, although this is not in the nature of true flight; and their aërial evolutions are very graceful. They sleep during the day and become active in the evening. They feed on fruits, leaves, insects, etc. A New Guinea species is about as large as a flying lemur; one of the Australian species (*Acrobates pygmæus*) is scarcely larger than a mouse and feeds on the nectar of flowers and some insects. The fur of some of them is rich and beautiful. "Petaurist" has been proposed as an English name for these animals, but is not much used. See Marsupialia, and the authorities there cited.



DENTITION OF FLYING PHALANGER.

FLYING ROBIN. See Flying Gurnard.

FLYING SQUID. A squid of the genus *Ommastrephes*, having a tail so large as to be able to leap out of the water, high enough sometimes to fall upon the decks of ships. They form a principal part of the food of many of the whales and are often the prey of albatrosses, petrels, and other marine birds. Some species reach a length of several feet. See Squid.

FLYING SQUIRREL, skwĕr'rĕl *or* skwĭr'rĕl. A squirrel which has a fold of the skin of the flanks (a "parachute") extended between the fore and hind legs and partly supported by bony processes of the feet, by means of which it is enabled to take extraordinary leaps, gliding for a great distance through the air. The distichous tail also aids to support it in the air as well as to direct its motion. The single family, Petauristidæ, containing rodents with these characters, is divided into eight genera, one of which *Sciuropterus*, is represented in Europe, Asia, and North America. The other genera contain large species characteristic of the Indian and East Indian region. The European species (*Sciuropterus rusticus*) is about the size of a rat, grayish ash color above, white below, the tail only half the length of the body; it lives solitary in the forests. Its fur is of little value, but skins are sometimes mixed with those of the gray squirrel, to impose on the purchaser. The most common North American species (*Sciuropterus volans*), common in the central eastern United States, is fully 5 inches long, plus a tail equally long. It is brownish gray above, white beneath, and a black line surrounds the orbit of each eye. Four species and some 17 races are recognized in North America, ranging from Florida to Alaska.

All the flying squirrels inhabit woods, and the night is their time for activity. They feed not only on nuts and young shoots of trees, but also are said to kill and eat small birds and to rob birds' nests. They are easy of domestication, but are apt to bite and do mischief to furniture and hangings, especially by gnawing woolen stuffs to pieces as material for their nests. These are naturally placed in some cranny of a hollow tree, preferably a deserted woodpecker's hole, but may be placed within a house. In gliding from tree to tree the flying squirrel descends obliquely and with very rapid motion, until near the tree which it seeks to reach, when it wheels upward and alights on the trunk. Fifty or 60 feet is the ordinary length of its flight. See Squirrel, and the authorities mentioned thereunder; and Plate of Squirrels. Consult Seton, *Life-Histories of Northern Animals* (New York, 1909).

The name is also applied in Australia to flying phalangers (q.v.), and in Africa to the scale-tailed squirrels of the family Anomaluridæ. These little creatures, which belong in West and Central Africa, much resemble American flying squirrels in appearance and habits, but the tail is more slender, and has on its inferior surface and margins, near the root, a series of large imbricated scales, that are of service in climbing; the parachute is distended and supported by a stiff cartilaginous process from the olecranon. Consult *Proceedings Zoölogical Society of London* (London, 1874–75).

FLY MUSHROOM, or **FLY AMANITA.** See Amanita; Fungi, Edible and Poisonous.

FLYNT, Josiah (properly Josiah Flynt Willard) (1869–1907). An American sociologist and author, born at Appleton, Wis. He was educated at the University of Berlin in 1890–95 and after several years of experience as a professional vagrant published in 1899 *Tramping with Tramps*, a novel and picturesque study. His further works dealing with the lower and criminal classes include *The Powers that Prey* (1900), a collection of short stories written in collaboration with Francis Walton; *Notes of an Itinerant Policeman* (1900); *The World of Graft* (1901), also a volume of short stories; and *The Little Brother* (1902), his only sustained attempt in fiction.

FLY SNAPPER. One of the names of a rare and very beautiful crested flycatcher (*Phainopepla nitens*) of the southwestern United States. It is entirely rich lustrous black with steel-blue or greenish reflections, and with a large white space on the inner webs of the wing quills. Its length is about 7½ inches. The female is brownish gray, but crested. It frequents bushes in the desert regions of Nevada, Arizona, and southern California. It also feeds extensively on various berries and has, in short, much the habits and manners of a waxwing. Its customary note is described as a "rattling call"; and it makes a rude nest in a bush or tree, and lays two eggs, greenish white, so thickly marked with dark brown and purple that some specimens seem almost totally black. Consult: Coues, *Birds of the Colorado Valley* (Washington, 1878); Bailey, *Handbook of Birds of the Western United States* (Boston, 1902); Nuttall, *Popular Handbook of the Birds of the United States and Canada* (ib., 1903).

FLY-UP-THE-CREEK. A local name in the United States for the little green heron, or shitepoke (*Ardea virescens*), common throughout the United States and southern Canada. See Heron.

FLY WEEVIL. A local name in the United States for the grain moth (*Gelechia cerealella*). See Grain Insects.

FLYWHEEL. A heavy wheel attached to the revolving shaft of a steam engine to serve as an accumulator and equalizer of power. Its action depends upon the mechanical law that a body once set in motion retains a certain amount of moving force or momentum which has to be overcome before motion ceases. Thus, a heavy wheel once set to rotating by some external force, as the pressure on the piston of a steam engine or internal-combustion motor, continues to rotate by virtue of its stored energy or momentum after this external force ceases to act. In a steam engine the function of a flywheel is: (1) to store up excess of energy received from the piston during the first part of its stroke under full steam pressure, and to give it out when, during the latter part of the stroke, the effort has grown less because of decreased pressure due to the expansion of the steam; (2) to equalize the variation in the leverage with which the varying steam effort acts upon the crank to revolve the shaft; (3) to give out or absorb energy when variation in the external load or resistance occurs suddenly. In the internal-combustion engine, which is usually single-acting, and operates in a cycle of events in which the power stroke occurs only once in four traverses of the piston, the flywheel becomes of special importance to secure regulation of the speed. (See Internal-Combustion Engines.) In the earlier single-cylinder engines the flywheel was of enormous weight, particularly when the engine drove an electric generator. Fluctuations of speed and of turning effort are here very undesirable, and the revolving mass of the generator is often counted on for flywheel action. In the smaller sizes of such engines, such as are used in boats and motor vehicles, the use of multiple cylinders has become very general, so as to lessen the irregularity of effort and to lighten the flywheel. Motor-vehicle flywheels are often combined with the engaging and disengaging mechanism called the clutch; and the high rotative speed is depended on to make a light weight effective in regulation. In marine engines the revolving screw or the paddle wheel functions as the flywheel in whole or in part. In the locomotive the driving wheels coupled together and with cranks at right angles are the engine flywheel; and the moving train is a very complete reservoir or accumulator of stored energy.

The flywheel is therefore, as described, an accumulator and an equalizer, and the reserve which it stores will be greater as its mass is greater, and the leverage greater with which that mass acts. Large mass means great weight and consequently great friction on the shaft bearings. Large leverage or large radius means more space required for the wheel and increased centrifugal force tending to disrupt its rim. The designer of a flywheel has to integrate these different factors to meet the requirements of space, speed of rotation, and other governing conditions. Modern practice shows a tendency to adopt smaller diameter wheels than were once customary; in early engines 30-foot flywheels were often to be met, but now 18 to 20 feet are large diameters in stationary engines, and in centre-crank high-speed engines 6 feet has become a large size. The strains which are set up in a flywheel because of the work which it has to do are, first, a torsional strain tending to twist the spokes off the hub, and, second, a strain due to centrifugal force which tends to burst the rim. A flywheel can easily be designed to resist torsional strains, but there is no possible way to overcome the centrifugal force; hence for a given material there is a definite speed at which disruption will occur regardless of the amount of material used. A recent authority gives the following simple formula for figuring the disrupting speed of flywheels having solid, single-piece rims:

$$v = 1.6\sqrt{\frac{s}{w}}.$$

In this formula v represents rim speed in feet per second at which disruption occurs, s represents the ultimate tensile strength of the material per square inch, and w represents the weight of the material per cubic inch. If, instead of ultimate strength, we let s represent the safe strength, then by solving the equation for v we get the safe rim speed in feet per second. If the wheel is made of sections bolted together, the ultimate and safe values of s in the above formula must be reduced to from one-half to one-fourth of the figure assumed for solid wheels. The safe rim speed of a solid cast-iron wheel figured according to this formula is about 100 feet per second, of a cast-steel wheel about 233 feet per second, and of a maple-wood wheel about 155 feet per second.

The disruption or bursting of a flywheel revolving at high speed occurs with great force, the flying fragments often wrecking the engine and building in which it is housed and sometimes being thrown several hundred feet away. Flywheel accidents are less common than formerly, but are still frequent enough to make the designing of strong and safe wheels a problem for serious study by engineers.

In early engines turning with a low number of revolutions the flywheel required to be of large diameter, and was for this reason nearly always distinct from the wheel from which the power was taken off. In more modern engines the convenience of having the flywheel serve also as an element of the transmission machinery has brought about the use of fly-band wheels, where belts or ropes are used to take off the power from the engine shaft. It is so much less the practice in recent years to use gearing in transmitting the power from the engine shaft that the flywheel is seldom a toothed wheel. Small flywheels are usually made in one piece of cast iron or cast steel. Larger sizes are cast in halves, which are connected by bolted joints to form the complete wheel, and the largest wheels are cast in several segments which are bolted together. Flywheels are sometimes made with metal hub and arms and a rim of some tough, hard wood. Other constructions are steel plates riveted together, and cast wheels with their rims wound with steel wire of great strength. (See STEAM ENGINE.) Very complete data for use in the calculation and design of flywheels will be found in Kent's *Mechanical Engineer's Pocket-Book* (8th ed., New York, 1913).

FO. The Chinese equivalent for Sanskrit Buddha. See BUDDHISM.

FOA, fō-ȧ′, EUGÉNIE (1798–1853). A French romance writer, born at Bordeaux. She was by descent a Spanish Jewess, and her maiden name was Gradis. She married young, but soon left her husband, and, despite delicate health and failing eyesight, she supported herself by her pen, using at times the nom de plume "Maria Fitzclarence." Madame Foa's books include: *Le ridouschim* (1830); *La Juive: histoire des temps de la régence* (2 vols., 1835); *Les mémoires d'un polichinelle* (1839); *Le petit Robinson de Paris* (1840); *Le vieux Paris* (1840). She wrote charming tales for young people, with the moral not unduly prominent.

FOAKES-JACKSON, FREDERICK JOHN (1855–). An English theologian, born in Ipswich and educated at Eton and at Trinity College, Cambridge (B.A., 1879; M.A., 1882). He was ordained in 1880 and became divinity lecturer (1882), fellow (1886), and dean of Jesus College, Cambridge. He edited *Parting of the Ways* (1912), essays by members of Jesus College, and in 1902 was Hulsean lecturer. He wrote: *History of the Christian Church to A.D. 337* (1891; 5th ed., with additions to 461 A.D., 1909); *Christian Difficulties: A Study of Marcion* (1903); *A Biblical History of the Hebrews* (1903; 3d ed., 1910); *Biblical History for Schools* (vol. i, Old Testament, 1912; vol. ii, New Testament, with B. T. D. Smith, 1913).

FOCA, fōt′chȧ, or **FOTCHA.** A Bosnian town of about 5000 inhabitants, situated at the confluence of the Drina and Tchehotina rivers, near the Montenegrin frontier (Map: Austria-Hungary, F 5). The Mohammedans regard it with particular reverence on account of its mosques, which are reputed to be the most splendid and the oldest in Bosnia. It was the seat of turbulent wars during the Middle Ages well after the Turkish occupation of the region. In the sixteenth century it acquired commercial importance on account of its position on the inland highway connecting Ragusa and Constantinople.

FOCAL LINES. See FOCI; LIGHT.

FOCH, MARSHAL FERDINAND. Generalissimo of the Entente armies. For his biography see VOLUME XXIV.

FOCI (Neo-Lat. nom. pl., points, from Lat. *focus*, hearth, ML., central point). Points the distances of which from any point on a given curve are connected by a definite relation. In the case of conics the foci are points on the principal axis, such that the corresponding double ordinate is equal to the parameter of the curve. The term "focus," used in this sense, is due to Kepler (1604). By varying the values of the constants in the equation $y^2 - m^2x^2 = 2px$, it may be made the equation of an ellipse, parabola, or hyperbola, according as m^2 is < 0, $= 0$, or > 0. The abscissas of the foci will be found by substituting $y = p$ in the equation of the curve, whence

$$x = \frac{-p(1 \pm \sqrt{m^2+1})}{m^2}.$$

From these values of the abscissas, considering m^2 as positive, zero, and negative successively, we see that the ellipse and hyperbola have two finite foci, while the parabola has one finite focus and one at infinity. The name "focus" was originally given to these points from the fact that rays of light emanating from either focus are reflected by the curve through the other. The distance from the foci of curves to every point of the curve can be expressed rationally in terms of the abscissas of the points—a unique property. Curves of higher degree may have several foci. (See CARTESIANS.) The foci of a conic possess the property that the straight lines which connect them to the circular points at infinity are tangents to the curve. In general a point P is said to be a focus of a curve when the lines connecting this point with the circular points at infinity are tangents to the curve. A curve of the nth class has n^2 foci, but, the curve being real, n and only n of these foci are real. See CURVE; ELLIPSE; PARABOLA.

In optics the term "focus" is employed to designate a point at which rays meet and are collected after being reflected or refracted. A point from which rays appear to come after reflection or refraction is termed a "virtual focus." The "principal focus" is the focus of parallel rays after reflection or refraction. See LENS; MIRROR; LIGHT.

FOCUS. See FOCI.

FODDER. See FEEDING STUFFS.

FODDER, GREEN. See SOILING; SILAGE.

FODERÉ. See PRADIER-FODERÉ.

FŒDERA, fĕd′ĕr-ȧ (Lat., treaties). A collection of documents bearing on state transactions between the kings of England and others from 1101. Fifteen volumes were compiled by Thomas Rymer (q.v.) from 1693 to 1713, and after his death five volumes were used by Robert Sanderson (1715-35), covering the documents down to 1654. The work as abridged in a French version by Rapin was retranslated into English by Stephen Whatley, under the title *Acta Regia* (1731).

FŒTUS, fē′tŭs (Lat., offspring). The term applied to the unborn young of viviparous animals, especially in the more advanced stages. In the human subject the term "fœtus" is applied to the embryo, though more often to the unborn child after the end of the fourth month, when human features are distinguishable. The *fourth-month* fœtus weighs about five ounces and is about 6 inches long; its brain convolutions are found to be developing, and its sex is recognizable; its muscles are capable of producing movements of the limbs, and ossification can be traced in the bones of the skull. The *fifth-month* fœtus weighs about 10 ounces and is about 10 inches long; hair and nails appear, and ossification in the ischium takes place in course of the fifth month. The *sixth-month* fœtus weighs about one pound and is 11 or 12 inches long; its eyelids, with eyelashes formed, are closed; fat gradually develops under its skin, and its pubic bones undergo ossification. The *seventh-month* fœtus weighs from three to four pounds and is from 13 to 15 inches long; its skin is covered with sebaceous matter, and the fat under its skin attains to a considerable amount; its eyelids are open. The *eighth-month* fœtus weighs from four to five pounds and is from 16 to 18 inches long; its nails are completely developed, and the membrana pupillaris has disappeared. The *ninth-month*, or full-term, fœtus weighs from five to nine pounds, or six and one-half pounds on an average, and is from 17 to 21 inches long. The average weight and length of the male infant slightly exceed those of the female, even at birth; the average excess in weight is about 12 ounces, the average excess in length about 4.8 inches. Clark observes that if, at the full term, the weight of the infant is less than five pounds it rarely thrives, though a few cases are recorded of surviving children who weighed one pound at birth. On the other hand, various instances are recorded of infants in which the weight at birth exceeded twice the average weight. There are certain points in which the fœtus at the full period differs anatomically from the child shortly after birth. The bony skeleton is very incomplete, cartilage occurring in the place of many bones. Indeed, complete ossification (e.g., of the vertebræ) is not finished until about the twenty-fifth year, and the only bones completely ossified at birth are the minute ossicles of the ear. The difference between the fœtus and the child in this respect is, however, only one of degree.

During pregnancy a temporary organ, termed the placenta (popularly known as the afterbirth, from its being delivered shortly after the child), is developed on the inner wall of the uterus. This organ is mainly composed of vessels, and there proceeds from it the structure known as the umbilical cord, in which lie the umbilical vein, which conveys arterial blood to the fœtus, and the two umbilical arteries, which return the blood to the placenta. This umbilical cord conveys these vessels to the umbilicus, or navel. In the heart we find a communication between the two auricles by means of an opening termed the *foramen ovale*. In the arterial system we have to notice, first, the *ductus arteriosus*, which is a large communicating trunk between the pulmonary artery and the descending aorta; and, secondly, the branches given off by the internal iliac arteries, which go under the name of hypogastric as long as they are within the body of the fœtus, and of umbilical when they enter into the structure of the cord, and are continued from the fœtus to the placenta, to which they return the blood which has circulated in the fœtal system. In the venous system there is a communication between the umbilical vein and the inferior vena cava, called the *ductus venosus*.

Pure blood is brought from the placenta by the umbilical vein, which passes through the umbilicus and enters the liver, where it divides into several branches, which are distributed to that viscus, the main trunk, or *ductus venosus*, passing directly backward, and entering the inferior vena cava. The pure blood here becomes mixed with the impure blood which is returned from the lower extremities and abdominal viscera, and is carried into the right auricle, and from thence, guided by the Eustachian valve (which is situated between the anterior margin of the inferior cava and the auriculo-ventricular orifice, and is of relatively large size in the fœtus), passes through the *foramen ovale* into the left auricle. From the left auricle it passes into the left ventricle and into the aorta, whence it is distributed by the carotid and subclavian arteries principally to the head and upper extremities, which thus receive comparatively pure blood. From the head and arms the impure blood is returned by the superior vena cava to the right auricle; from the right auricle it is propelled, as in the adult, into the right ventricle, and from the right ventricle into the pulmonary artery. In the adult it would now pass through the lungs and be oxygenized; but in the fœtus it passes through the *ductus arteriosus* into the commencement of the descending aorta, where it mixes with that portion of the pure blood which is not sent through the carotid and subclavian arteries. Some of this mixed blood is distributed by the external iliac arteries to the lower extremities, while the remainder (probably the larger portion) is conveyed by the hypogastric or umbilical arteries to the placenta. Almost immediately after birth the *foramen ovale* becomes closed by a membranous layer, and the *ductus arteriosus* and *ductus venosus* rapidly close and degenerate into impervious fibrous cords. The lungs, previously to the act of inspiration, are dense and solid in structure and of a deep-red color and lie far back in the chest. Their specific gravity is greater than water, in which they (or portions of them) consequently sink, whereas lungs, or portions of lungs, that have respired, float in that fluid.

Children born in the seventh month of gestation are capable of living, although they usually require much care; and children may be born alive at any period after the beginning of the sixth month, or even in some instances earlier than the sixth; but this is rare, and, if born living, they commonly die soon after birth. See GESTATION; EMBRYO; EMBRYOLOGY, HUMAN.

FOG, or **MIST** (Dan. *fog*, Icel. *fok*, spray, from *fjūka*, to be driven by the wind). Anything that obscures the clearness of the atmosphere, but specifically in meteorology the obscuration caused by the very minute globules of water floating in the air. Because of their minuteness, the fog particles have not sufficient weight to descend rapidly in the presence of the atmosphere; they are not hollow vesicles or spheres having an inherent buoyant gas, as was once supposed, but are upheld by the slightest currents of air; the slowness of their progress downward is due mostly to the viscous resistance or internal friction of the air. These particles of water represent the condensation of vapor that was invisible a short time before. This has been condensed into fog particles, not by coming in contact with or by passing over colder bodies, but either by radiation of heat or by expansion and dynamic cooling. The latter is more frequent in the case of high fogs, but the former in the case of the ordinary fogs at sea level. In general, when a mass of warm moist air rolls over cold land or cold water, it radiates its warmth downward to the colder layers. On the other hand, when cold air flows over warm land or water, the vapor rising from the latter is also quickly condensed, as it cools both by contact and by radiation. Thus fogs are formed over lakes, rivers, and marshes in the evening when the warm vapor from these penetrates the colder air above. Whenever cold dry air from the American continent flows southeastward over the Gulf Stream, fogs are formed. Or whenever cold and warm streams of water lie adjacent to each other, the air from the warmer, moister region is carried over to the cold water, and cools by radiation until fog is formed. The densest fogs off the eastern coast of New England and Newfoundland come with an east or southeast or southwest wind. Those on the Pacific coast of California come with the west and northwest winds. The light morning fogs over grassy plains and swamps are due to cooling by radiation and occur in still, clear weather within areas of high pressure. In general, every particle of fog has a minute nucleus of dust or germs, or other solid particles, so that it is often injurious to health to inhale it. See DUST.

Electrons and ions have also been found to serve as condensation nuclei in fog formation, and Barus has made an elaborate study of this phase of the phenomenon. Aitken has also made a recent study of a process wherein the sun's rays themselves seem to initiate dense haze or fog after sunrise where no fog was present before.

Recent studies have brought out the fact that city fogs are more persistent than country fogs; that minimum temperatures are higher in cities than country, due chiefly to the blanketing effect of city fogs; and that city sunlight is much poorer photochemically than the country sunlight. An excellent statement of our knowledge of fogs and a selected bibliography of the subject is given by H. H. Kimball in the *United States Monthly Weather Review*, vol. xlii, pp. 29–35 (Washington, January, 1914).

The fog known as London fog, or dry fog, is due principally to the condensation of aqueous vapor upon the immense number of nuclei floating in the atmosphere as smoke from the soft-coal fires. In London the deaths during foggy weeks always exceed those during pleasant weather. See FOG SIGNALS; HAZE.

FOGARASSY, fŏ′gŏ-rŏsh-ê, JÁNOS (1801–78). An Hungarian jurist and philologist, born at Käsmark (County of Zips). In 1829 he was admitted to the bar, in 1848 became Councilor in the Hungarian Finance Ministry, and subsequently President of the Council of Commerce and a judge of the Supreme Court. He wrote on Hungarian jurisprudence and finance (*The Hungarian Law of Trade and Exchange*, 1840; *The Hungarian Bank*, 1848), but is best known for the great *Dictionary of the Hungarian Language* (6 vols., 1861–74), prepared under the auspices of the Hungarian Academy of Sciences (from 1861 to 1866 in collaboration with Gergely Czuczor). This work is very inclusive and continues to be regarded as standard, despite the fact that it often is at variance with the principles of modern philology.

FOGAZZARO, fŏ′-gȧt-tsä′rô, ANTONIO (1842–1911). An Italian novelist and poet, of Vicenza, famous as the most profound representative of the Catholic movement in recent Italian belles-lettres. His earlier works—lyrics, short tales, and a few romances—showed him as a sentimentalist, with some gift for realistic analysis. *Malombra* (1882; trans. by Dickson as *The Woman*, Philadelphia, 1907) was the first of the five romances upon which his international reputation rests: it is a study of psychic pathology executed with romantic weirdness. There is a beautiful lyric splendor in *Daniele Cortis* (1887; trans. by Mantellini as *The Politician*, Boston, 1908): its portrayal of high idealism sustained by indomitable will formed a startling contrast with the sophisticated licentiousness of the Italian exponents of the superman headed in the eighties and nineties by D'Annunzio. *Piccolo mondo antico* (1895), *Piccolo mondo moderno* (1901), and *Il Santo* (1905), translated respectively as *The Patriot*, *The Sinner*, and *The Saint* (Boston and New York, 1907), by Pritchard, form a trilogy of definitely Catholic *tendenz*. Franco Maironi, a Catholic, finds in his faith a strength to meet the sorrow that crushes his more intellectual wife. Their son Piero survives similarly the disaster that overtakes his married life; and the moral vision he thus acquires not only elevates him beyond secular temptations, but spurs him on to religious rejuvenation of the church. This distinct recognition of good and bad trends in the Catholic system injected the *Santo* into the modernist question and led to its proscription on the *Index*. The author bowed to the condemnation under a protest which he recorded in *Leila* (1910); though the church have elements hostile to the truth, it still is entitled to the loyalty of true Catholics. Fogazzaro's characters have a substantial truth and vitality that give his romances an important place in modern Italian letters. Consult biography by Molmenti (Milan, 1900); articles by Thayer in the *Nation* (New York, 1911) and McKenzie in *Yale Review* (1912).

FOGBOW. A white halo formed in or on the surface of a bank of fog. See HALO.

FOGELBERG, fō′gel-bĕrk, BENGT ERLAND (1786–1854). A Swedish sculptor. He was born at Gothenburg and studied first at the Academy of Stockholm, where he was influenced by Bergell. He then went to Paris (1818) and studied painting under Guérin and modeling under Bosio. Subsequently he went to Rome, where he produced a statue, "Mercury" (1825), which was praised by Thorvaldsen, and his talent won immediate recognition. He was appointed court sculptor by King Charles XIV, and upon his return to Sweden in 1854 he was received with great honor, but his health failed, and at the height of his fame he died suddenly at Triest on his return to Italy. Fogelberg was one of the first to attempt a plastic representation of the northern gods and, like Thorvaldsen, sought his inspiration in Greek art. In spite of undoubted talent and some originality, his success was only partial, as his "Odin," "Thor," and "Baldur" in the Stockholm Museum testify. He is at his best in classical mythological subjects, such as "Venus Victrix" and "Cupid and Psyche" (both in Stockholm Museum), and in his portrait statues, which include those of Charles XIII, Charles XIV, Gustavus Adolphus (1849), at Gothenburg; and "Birger Jarl" (1853), on the Riddarholm Place, Stockholm. Consult Leconte, *L'œuvre de Fogelberg* (Paris, 1856).

FOGGIA, fŏj′å. A flourishing city in south Italy, capital of the Province of Foggia, 123 miles northeast of Naples (Map: Italy, E 4). The Norman cathedral, erected in 1179, was partly destroyed by an earthquake in 1731; it was afterward rebuilt in modern style. Piazza Federigo Secondo, with its Emperor's Fountain, commemorates the fact that Frederick II was often a resident. In 1240 he held a parliament here. The city has a beautiful customhouse, a theatre, a gymnasium, a technical institute, a school of industry, a city park and botanical gardens, and a library. It is the principal market of the great Apulian plain which produces wine, oil, grain, cattle, and capers. In the country outside of Foggia many sheep graze. Pop. (commune), 1901, 53,151; 1911, 76,688.

FOGHORNS. See FOG SIGNALS.

FOGLIETTA, fō-lyĕt′tå, UBERTO (1518–81). An Italian historian, born in Genoa, of a noble family, and educated at Padua and Rome. The outspokenness of his first work, *Delle cose della pubblica di Genoa* (1559), caused his banishment from his native city and the loss of his estates, so that he spent the remainder of his life in Rome under clerical protection and devoted himself to literature. Four volumes of his historical essays were published in Rome in 1579, under the title of *Clarorum Ligurum Elogia*. His important *Historiæ Genuensium* (1585) was translated by Sardanati into Italian. Consult G. Campori, *Documenti per la vita di U. Foglietta* (Modena, 1870), and articles by A. Neri and R. Renier in *Giornale liguistico* (Genoa, 1877, 1888).

FO′GO (Portug., fire; so called from the volcano in the island). One of the Cape Verde Islands (q.v.), lying west of Santiago. It has an area of 188 square miles and about 16,500 inhabitants. The soil is productive, but the climate is unhealthful. Its volcano is over 9000 feet high. Chief town and port, Nossa Senhora da Luz, or São Filippe.

FO′GO. A port of entry, capital of Fogo Island, at the east-southeast entrance to Notre Dame Bay, Newfoundland, 165 miles northwest by north of St. John's (Map: Newfoundland, F 3). It is a fishing and trading port. Pop., 1901, 1118; 1911, 1152.

FOG SIGNALS. The chief use of fog signals is to give warning to approaching vessels when not in sight of one another, to enable them to continue their respective courses after having first localized the direction and distance of the neighboring ship. In addition, fog signals are most useful indications of dangers to vessels approaching headlands or feeling their way through narrow channels.

In considering the first-mentioned use of the fog signals, the International Marine Conference, held at Washington in 1890, concluded that all steam vessels should be provided with an efficient whistle or siren, sounded by steam or some substitute for steam, so placed that the sound is not interrupted by any obstruction, and having an efficient foghorn to be sounded by mechanical means, and also an efficient bell. In fog, mist, falling snow, or heavy rainstorms, whether by day or night, the following signals are to be used: A steam vessel having way upon her is to sound a prolonged blast at intervals of not more than two minutes. A steam vessel under way, but stopped and having no way upon her, is to sound at intervals of not more than two minutes, two prolonged blasts, with an interval of about one second between them. A sailing vessel under way sounds at an interval of not more than one minute, one blast when on the starboard tack, two blasts in succession when on the port tack, and three blasts in succession with the wind abaft the beam. A vessel at anchor is to ring her bell rapidly for about five seconds at intervals of not more than one minute. When a vessel anchors in other than ordinary anchorages, and is in danger of being an obstruction to vessels under way, if a steam vessel, she must sound two prolonged blasts with her whistle or siren, with not more than a two minutes' interval, followed by ringing her bell; if a sailing vessel, at intervals of not more than one minute, two blasts with her foghorn, followed by ringing her bell. A vessel when towing, at intervals of not more than two minutes, sounds three blasts in succession, viz., one prolonged blast followed by two short blasts. A vessel towed can give this signal, but she cannot give any other. When one steam vessel wishes to indicate to another that she can feel her way past, she can do so by sounding a short blast, followed by a long and a short, with intervals of about one second between them. A cable ship, at work, hearing another vessel's fog signal, answers it with three prolonged blasts in succession.

Sailing vessels and boats of less than 20 tons' gross tonnage are not obliged to give the signals required of large sailing vessels; but if they do not they are to make some other efficient sound signal at intervals of not more than one minute. Every vessel in foggy, misty weather, or in snow or heavy rainstorms, is obliged by the rules adopted to go at a moderate speed, having careful regard to the existing circumstances and conditions. When a steam vessel hears, forward of her beam, the fog signal of a vessel, the position of which is not ascertained, she must, as far as the circumstances of the case admit, stop her engines and then navigate with caution until danger of collision is over.

The international rules apply to deep-water navigation throughout the world. In addition, nearly all nations have prescribed rules for their inland waters. These do not differ in general principle from the deep-water rules, but the details are frequently much amplified and adjusted to the particular needs of the vessels plying the waters in question. In inland rules the time between signals is usually reduced. Thus, under the United States inland rules steamers must sound their whistles every minute instead of every two minutes, as required by the international rules.

Experiments made in Holland on the force and duration of sound signals show that a steam whistle two inches in diameter requires a pressure of about two atmospheres in order to make the sound heard at the distance of 1 kilometer (0.62 mile); whereas a steam whistle of 6 inches' diameter, with a pressure of six atmospheres, makes its sound heard about 14 kilometers (8.68 miles). If, however, the whistle be placed in a horizontal position within a reflector, the 2-inch whistle can be heard at 4 kilometers (2.4 miles), which is about the same distance that a vessel's side lights are visible. With a bell of 8 inches' diameter sound travels only 600 meters (1868 feet), and it requires a bell of a weight of 80 kilograms (about 176 pounds) to transmit the sound 1500 meters (4920 feet). The sound of a movable bell (i.e., when the tongue or clapper is fixed) travels farther than when the reverse is the case.

On many points along the coast, in the lighthouses and on lightships, steam whistles and horns of great power have been placed, and also bells that are rung mechanically, which are sounded whenever the state of the atmosphere requires it to be done. The simplest and commonly most powerful signal employed by the United States Lighthouse Service is the locomotive whistle, operated by a steam boiler with a pressure of from 50 to 75 pounds. The sounds from the land are distinguished from those on board ship by the length of the notes and the intervals between. The whistles are from 8 to 10 inches in diameter and are operated automatically by an engine supplied with steam from the same boiler. The Daboll trumpet, worked by condensed air, is next in importance. The trumpet itself provides the resounding cavity, and the vibratory motion of the air is produced by a "reed." The reed is an iron bar, in the larger trumpets being 18 inches long, 2 inches wide, and ¾ of an inch thick, gradually lessening towards the free end. The siren trumpet is the most powerful instrument so far employed. (See SIREN.) The impulse to the air which produces the sound is given by a flat drum, or a hollow cylinder with a short axis, one end of which is perforated to admit steam. On the other side the drum is perforated with eight or more holes, in connection with which is a revolving disk having a similar number of holes. As the disk revolves, these eight holes are alternately open and shut, allowing egress to as many jets of steam, which provides a regular and violent motion in the air, giving rise to a most powerful sound, reënforced by the resonance of a trumpet of suitable length. In still air this sound can be heard from 20 to 30 miles, even during a dense fog. The notes are not all to be heard at the same distance, however, and an opposing or crossing wind seriously interferes with the transmission of sound. The intervention of rain, snow, or mist also disturbs and retards, and temperature has a distinct influence. Whistling buoys and bell buoys are also largely used to mark dangers or channels, and are of great assistance in determining the whereabouts of a vessel in thick weather. For a thorough discussion of various forms of fog signal, the reader is referred to Johnson, *Modern Lighthouse Service* (Washington, 1889).

Railway trains depend largely upon torpedoes to indicate the too close approach of one train to another. The torpedoes are small, flat tin cases charged with a detonating powder which are exploded by the wheels of the passing train and make a loud report. These are not only used in foggy weather, but also when there is any obstruction along the line that would expose approaching trains to danger of collision, derailment, or any similar accident.

While fog signals have been made which may be heard at considerable distances, yet the apparent directions from which they come are often deceptive, and much of the good which might otherwise be accomplished by these signals is rendered nugatory because of the difficulty of locating exactly their direction. This has been to a considerable extent obviated by the invention of the topophone by Col. D. P. Heap, Corps of Engineers, U. S. A. This instrument not only assists in hearing sounds at greater distances than is possible with the unassisted ear, but also assists in locating with more exactness the direction from which the sound comes.

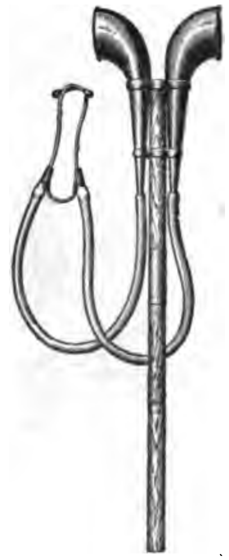


FIG. 1. TOPOPHONE.

It consists of two acoustic receivers or trumpets pointing in opposite directions and supported on a vertical shaft. (See Fig. 1.) From the lower ends of the trumpets extend rubber tubes connected with the ears by especially constructed earpieces.

The observer holds the shaft so that the instrument is above his head (see Fig. 2); if the sound is heard in the right ear, it shows at once that the noise must be somewhere on his right side. By oscillating the trumpet so that the sound is heard alternately in each ear, the sound will be in the direction inside of the angle of oscillation; this angle is generally about one point of the compass. The operation is simple and takes but a few seconds.

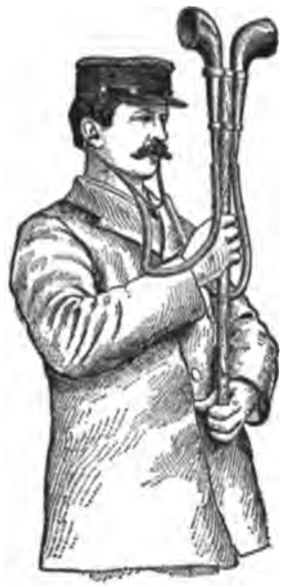


FIG. 2. METHOD OF USING TOPOPHONE.

The direction of the sound being once ascertained, the observer can readily keep the topophone pointed in this direction. Knowing the speed of the vessel and its course, the location of the sound can be quickly plotted accurately enough for practical purposes.

While the topophone above described aids to ascertain the direction of the sound, various attempts have been made to have direct indications of the approximate direction of the sound by varying its character for different points of the compass. The Foster fog signals, which have been adopted by the United States Lighthouse Service, are designed to accomplish this and are at times of much assistance to navigators. The apparatus is a species of sound director, which concentrates and projects various signals, first in one direction and then in another, varying the signal sound according to the direction to which it is sent. A passing vessel may therefore hear one of these sounds more clearly than the other, and the signal heard most distinctly indicates a close approximation to the exact direction from which the sound comes.

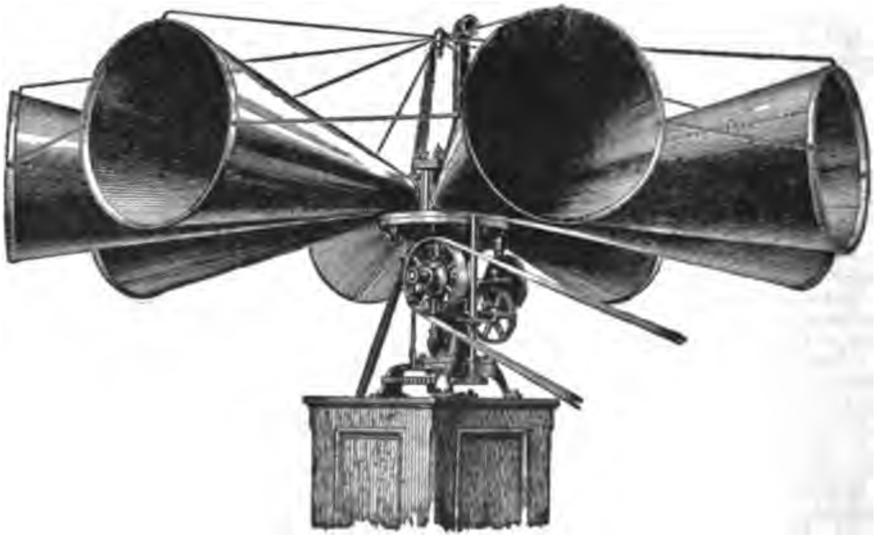


FIG. 3. LIGHTHOUSE MACHINE, WITH FIVE-FOOT MEGAPHONES.

The sound director consists of eight stationary megaphones, each being directed to one of the points of the compass, as shown in the illustration. It is also made of a single automatic revolving megaphone, which emits the appropriate sound on arriving at each point of the compass. Different points of the compass are indicated by a simple code of long and short blasts, the opposite points of the compass being in each case reversed; e.g., north is one long blast, south is one short blast, west is a short blast and a long blast, and east is a long blast and a short blast. The signals for the different points of the compass are indicated on the accompanying diagram (Fig. 4).

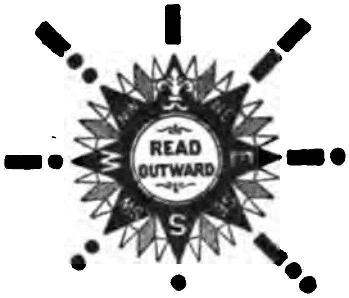


FIG. 4. SIGNAL CODE.
Dots denote short blasts, and dashes long blasts.

The diagram Fig. 5 shows the relation of the sounds as between two passing vessels.

When two signals are heard with equal clearness, both louder than the following one, the direction of the danger must be midway between the points which are heard with equal distinctness. These signals may be placed on shore at lighthouse stations and ferry slips, etc., aiding in the latter case the facility of a ship's attaining its proper slip, even in very foggy regions, provided there are no other slips in the vicinity or so many moving vessels as to cause a confusion of signals. The method adopted for this purpose is indicated in Fig. 6.

The submarine bell signal apparatus is now much used for determining direction in fogs. It consists of a bell which is rung under water from a lightship or buoy and is operated by pneumatic mechanism or the waves in buoys too far from shore to be connected by an electric cable. The receiving apparatus is placed against the inner side of the side plating on each side of the bow of a ship. It consists of a small cast-iron tank (placed well below water) which contains two microphones. The sounds of the bell, coming through the water, enter the water of the tank and are picked up by the microphones, which in turn transmit them to the indicator box in the pilot house or chart room. Switches in the indicator box enable the observer to listen alternately to the port and starboard microphones and determine by the relative loudness on which side the sound is coming from. By changing the heading of the ship the approximate direction of the sound is ascertained. Very many of the larger vessels of the mercantile marine and the navy are equipped with the receiving apparatus, as are the important light-vessels and fog-signal stations.

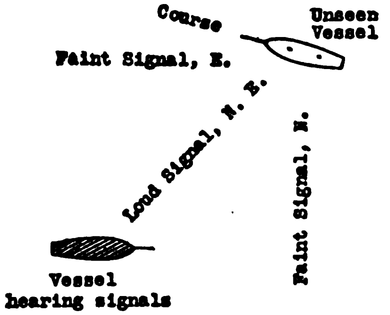


FIG. 5. RELATION OF SOUND BETWEEN TWO VESSELS.

Notwithstanding the efforts made to ascertain directions in a fog, at times all means fail. There are conditions under which the sound seems to be deflected and appears to come from some other than the true direction or from a direction impossible to define. Under other conditions the sound is greatly reduced or absolutely nullified in certain directions or over certain areas while audible at greater or less distances and in other directions. These temporary areas of "silence" are often quite close to the source of sound.

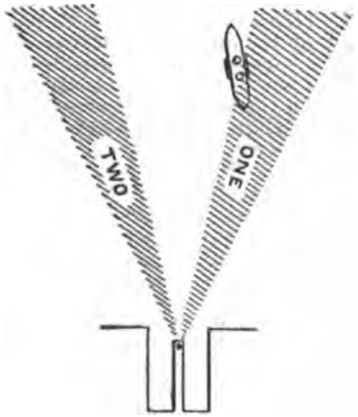


FIG. 6. FOG SIGNAL ON FERRY SLIP.

In the navy it is frequently necessary for the fleet to cruise in formation during a fog. As the vessels are out of sight of each other in dense fogs, a *towing spar* is fitted. This consists of a wooden float so built as to throw a certain amount of spray and otherwise show a definite wake and is towed at the end of a line of such length that it is only a few yards from the bow of the following ship. At night and sometimes during the day searchlights are used to give the direction to the following ship. In very thick fogs their use has proved very successful in enabling a ship to keep at a proper distance from and directly behind the ship ahead, each ship turning her searchlight directly astern. The light is clearly discernible even in the thickest fogs from a ship not more than 400 or 500 yards away.

Radio (wireless) telegraphy is being used to determine positions in fogs, especially as regards the courses of approaching vessels, and much information concerning weather, fogs, and dangers to navigation is spread broadcast from light vessels and stations. Attempts are being made to determine directions and distances in fogs by means of radio signals, but definite success has not yet been attained.

Consult: Joseph Henry, *A Summary of Researches in Sound* (Washington, 1879); A. B. Johnson, *Aberrations of Audibility of Fog-Signals* (ib., 1885); W. R. Livermore, *Report upon Fog-Signal Experiments* (ib., 1894); Alfred Hiebel, *Seezeichen, Leuchtfeuer und Schallsignale des alantischen Ozeans* (Hamburg, 1908).

FO-HI, fō′hē′. See FU-HI.

FÖHR, fẽr. One of the North Frisian Islands, situated in the North Sea, off the west coast of Schleswig (Map: Prussia, C 1). Area, about 32 square miles. The surface is partly elevated but mostly wooded marshland, the northern part being protected by a dike. The soil is productive. The population numbers about 4500, mostly Frisians speaking the North Frisian language. The chief occupations are fishing, hunting, and seafaring. The chief town is Wyk, a bathing resort on the east coast. Consult Philippsen, *Kultur und Naturbilder von Föhr* (Wyk, 1902).

FOIL (OF. *foil, fuel, fueill*, Fr. *feuille*, leaf, from Lat. *folium*, Gk. *φύλλον, phyllon*, leaf). In architecture, the concave curve connecting any two cusps (q.v.) in a cusped arch or tracery circle. A *trefoil* arch or circle is one having three cusps and foils, inclosing a three-lobed opening; a *quatrefoil*, one with four lobes: *cinquefoil, sexfoil, eightfoil* designate five, six, and eight lobes respectively. The foiling of Gothic arches and tracery is found in all the styles and by its character forms one of the marks of the style and period; it appears occasionally even in late Romanesque work, in which the foils are always round. Moorish arches are often numerously and minutely foiled. See ARCH; CUSP; TRACERY.

FOIL. A general name for thin metal intermediate in thickness between *leaf metal*, such as gold, silver, and copper leaf, and *sheet metal*. There are two distinct kinds of foil in common use: the very thin tinfoil used in chemistry, for electrical apparatus, and formerly for coating the backs of mirrors (q.v.); and the brighter, thicker foils, which, under the name of "tinsel," are made of copper, tin, tinned copper, or silvered copper, and are used by jewelers for theatrical and other ornaments. The foils used by jewelers for backing gems, sometimes called *Dutch foils*, consisting of small sheets of silvered copper rolled very thin, are colored with the following preparations, to suit the different gems under which they are to be placed, or for use as tinsel in the manufacture of theatrical ornaments, toys, etc.: Lake and Prussian blue, and pale drying oil finely ground with a slab and mullar—for amethyst color. Prussian blue similarly prepared—for sapphire color. Dragon's blood dissolved in pure alcohol—for garnet color. Ferrocyanide of iron and bichromate of potash, equal parts, very finely ground and sifted, then ground with a quantity of gum mastic equal to the other two ingredients, until the whole forms an impalpable powder; gradually form this into a thin paste with pure wood alcohol and preserve in a stoppered bottle; when used, a portion is diluted with wood alcohol to the necessary thinness—for emerald color. Various shades of yellowish or bluish green can be produced by varying the proportions of the two coloring materials. Lake or carmine ground in solution of isinglass—for ruby color. A weak solution of orange shellac, sometimes tinted with saffron, turmeric, or aloes—for topaz color. Several other color varnishes are made by similar methods for various shades of tinsel and gem foils.

Gold foil is chiefly used by dentists for filling teeth and differs from gold leaf only in being a little thicker. (See GOLD BEATING.) Commercial *tinfoil* is largely adulterated with lead and is used as a wrapping for tobacco, chocolates, and bonbons, toilet and other fancy articles. *Variegated* foil is made by laying 30 or 40 thin plates of gold, silver, copper, and various alloys in a regular order and then soldering the edges. A pattern of various depths is punched, and the metal hammered out into a thin sheet. The punch marks disappear, and the pattern, appearing sometimes in one and sometimes in another of the metals and much spread out, is very effective. It is suggestive of damaskeening on metal. See DAMASKEENING.

FOIL (probably from *foil*, to blunt, from OF. *fouler*, *foler*, *foller*, Fr. *fouler*, to trample, from ML. *fullare*, to full cloth by trampling, from Lat. *fullo*, fuller). A weapon used in fencing as a substitute for the short sword. See FENCING.

FOIX, fwä (Lat. *Fuxum*). The capital of the Department of Ariège, France, situated on the left bank of the river Ariège, 51 miles from Toulouse (Map: France, S., F 6). It has a picturesque old castle, with three well-preserved towers of white marble, dating from the twelfth and fourteenth centuries, and the old church of Saint-Volusien of the twelfth century. It has a lyceum, library, museum, and teachers' training school, also several large iron and steel works, and trades in flour, wool, cattle, resin, and iron. Foix was the capital of the old Countship of Foix. Pop. (commune), 1901, 7065; 1911, 6806.

FOIX. An old French family, which took the title of Count from the District of Foix.—The first who bore the title was ROGER, in the early years of the eleventh century.—RAYMOND ROGER, Comte de Foix, figures as one of the knights who accompanied Philip Augustus to Palestine; he died in 1223.—GASTON III, Comte de Foix, called Phœbus, married Agnes, daughter of Jeanne II, Queen of Navarre. He was a skillful warrior and fond of the chase. He wrote a work on the latter subject, which was greatly admired in the fifteenth century. Froissart (q.v.) owed some of the choicest incidents in his chronicles to having lived for some time in the castle of Orthes, Gaston's principal residence. After his death, in 1391, the estates and title went to a collateral branch of the family, as in a fit of anger he had killed his only legitimate son.—GASTON IV, Comte de Foix, rendered good service to the King in the wars against England. He died in 1472.—Gaston's grandson, GASTON DE FOIX, Duke of Nemours, was the son of Gaston de Foix, Comte d'Estambes, and of Marie d'Orléans, sister of Louis XII of France, and was born in 1489. In the Italian wars carried on by Louis, Gaston displayed the most brilliant and precocious genius. He was everywhere successful by the rapidity of his movements, which obtained for him the title of the *Thunderbolt of Italy*. He won the great battle of Ravenna over the Spaniards, April 11, 1512, in which, however, he fell, at the early age of 23. Consult Castillon, *Histoire du comté de Foix* (Toulouse, 1852), and Vic et Vaissète, *Histoire générale de Languedoc*, vol. iv (ib., 1872).

FOIX, ODET DE. See LAUTREC.

FOIX, PAUL DE (1528–84). A French ecclesiastic and diplomat. He studied in Paris and Toulouse and lectured on civil law. At the age of 19 he became a councilor of the Parlement of Paris. Through the favor of Catharine de' Medici he rose rapidly to power. As ambassador to England, he endeavored to bring about the marriage of Elizabeth to the Duke of Anjou. Later he was Minister at Venice, Florence, and Rome, and Plenipotentiary at the court of Henry of Navarre. He was made Archbishop of Toulouse in 1577 and was sent to Rome in 1579 as Ambassador, where he died, in 1584.

FO-KIEN, fō'kê-ĕn'. See FU-KIEN.

FOKSHANI, fôk-shä'nê (Rum. *Focsani*). A town of Rumania in Moldavia, situated on the Milkov, a branch of the Sereth, 47 miles west-northwest of Galatz (Map: Balkan Peninsula, F 2). The vineyards in its neighborhood produce one of the best kinds of Moldavian wines, and the town carries on a considerable trade in grain with Galatz. In 1789 Fokshani was destroyed by the Russians. It was burned by the Turks in 1822. Pop., 1899, 23,783, including about 6000 Jews; 1905, 24,183.

FOL, fōl, HERMANN (1845–92). A Swiss zoologist. He was born in 1845, of German parents, and lost his life at sea in 1892. He took a medical degree in Berlin in 1869, but devoted himself to zoölogical studies. He was especially interested in the investigation of marine animals and, being a man of wealth, was able to indulge his tastes by establishing a marine laboratory at Nice and visiting in his yacht the waters of various countries. His home was in Geneva, where for nine years he was professor of zoölogy. The following are among his more important works: *Die erste Entwicklung des Geryonideies* (1875); *Etudes sur le développement des mollusques* (1877); *Sur le commencement de l'hénogonie chez divers animaux* (1879); *Lehrbuch der vergleichenden mikroskopischen Anatomie* (1884); *Recherches sur la fécondation et la commencement de l'hénogonie* (1891); *Le quadrille de centres* (1891).

FOLARD, fō̍'lär', Jean Charles, Le Chevalier de (1669–1752). A French soldier and writer on military affairs, born at Avignon. He entered the French army and fought in several campaigns in the wars of Louis XIV. Later he enlisted in the service of Charles XII of Sweden and particularly distinguished himself at the siege of Frederikshald in 1718. His works include *Nouvelles découvertes sur la guerre* (1724) and *Commentaire sur Polybe* (6 vols., 1727–30), a work once much read and widely discussed, of which Frederick the Great prepared a résumé, *Esprit du chevalier de Folard* (1760; an unauthorized publication). He urged the superiority of column over line formation for attack and defense, but his theories meet with little approval, Marshal Saxe being the principal exception. Consult his *Mémoires* (Paris, 1753).

FOLCLAND, fōlk'lănd (AS., folkland), or **FOLKLAND,** fōk'lănd. The land of the folk, or the people of England in Anglo-Saxon times; the public domain. All land the title to which was not attested by charter, whether in private hands or not, was folkland or public land. It comprised the whole area of England that had not been assigned to individuals or communities at the first allotment and that was not subsequently divided into estates of bookland. It constituted in England a permanent source of revenue, for it could not be alienated without the consent of the National Council, differing in this respect from the public lands of other Germanic tribes; thus, the Lombards had public or state lands, but the pleasure of the King determined their disposal, while in England the King himself could not appropriate a part of the folkland without the consent of the Council. The English folkland had only an analogy, and not a similarity, to the common lands of the township in the mark system of the Teutonic races. The ownership continued to reside in the state, and the individuals who held portions, for which they paid rent and service, held only for life. The holders of folkland were liable to special burdens of a feudal character due directly to the state, and royal offices administered the jurisdiction. Such were the characteristics of the folkland down to the time of King Alfred. From his time the records contain less and less frequently the clause expressing the consent of the National Council to the alienation of the folkland. Gradually that body became only witnesses of the transaction, which received their attestation. Ultimately the folkland became hardly distinguishable from the royal demesne. Consult: Stubbs, *Constitutional History of England* (Oxford, 1874–78); Taylor, *The Origin and Growth of the English Constitution* (New York, 1898); Turner, *History of the Anglo-Saxons* (London, 1836).

FOLCMOT, fōlk'mōt (AS. *folcgemōt*, from *folc*, folk + *gemōt*, meeting, from *mētan*, OS. *mōtjan*, Dutch *moeten*, to meet), or Folkmoot. In early Anglo-Saxon England a national assembly or council. Later it came to be the assembly of the shire, composed of the representatives of the hundreds and townships. It met twice a year and was presided over by the Ealdorman, or the sheriff. In it cases concerning important persons and lawsuits between parties from different hundreds were tried, and questions of making war or peace were decided. Both lay and ecclesiastical cases were brought before it, and consequently the Bishop was present. It was also called a shiremoot.

FOLDING OF ROCKS. See Geology.

FÖLDVÁR, fēld'vär. See Duna-Földvár.

FOLENGO, fō-lĕŋ'gō, Teofilo. See Merlino Coccajo.

FO'LEY, John Henry (1818–74). An Irish sculptor. He was born in Dublin, May 24, 1818, and studied at the Dublin Society of Art and afterward at the Royal Academy, London. He made a decided reputation by his "Ino and Bacchus," in 1840. The works of his earlier period are chiefly of an ideal character and possess rare grace and freshness of conception for that day. Among the best of them are the "Youth at the Stream" (1844), "Mother" (1851), the "Elder Brother in Comus" (1860). "Egeria" (1856) and "Caractacus" are both in the Mansion House, London. He excelled, however, in his portrait statues, which are noted for their strength of characterization. Among them are those of Hampden (1844), Selden, and Sir Charles Barry, for the Houses of Parliament; the colossal bronze equestrian statue of Lord Hardinge, and those of Lord Canning and Sir James Outram, produced for Calcutta; Lord Clive, produced for Shrewsbury; Oliver Goldsmith, Edmund Burke, O'Connell, and Gough, at Dublin; Father Mathew, at Cork; John Stuart Mill, on the Thames Embankment; the group "Asia" and the "Prince Consort" for the Albert Memorial near Hyde Park. The best of these works are perhaps the three Indian notables at Calcutta, especially Outram. During the Civil War Foley designed the seal of the Confederate States of America. His last work was a bronze statue of Stonewall Jackson, for Richmond, Va. He died at Hampstead, Aug. 27, 1874. He was made an associate of the Royal Academy in 1849 and a member in 1858. Consult Monkhouse, *The Works of J. H. Foley* (London, 1875).

FOLEY, Sir Thomas (1757–1833). An English admiral. He entered the navy at the age of 13 and served on the *Otter* in Newfoundland. In 1774 he went to Jamaica and saw a good deal of service there against privateers; in 1778 he was made lieutenant and sent to America, under Lord Longford, and a year later took part in the Spanish campaign which terminated in the relief of Gibraltar. After service in America again, in the West Indies, and off Toulon (1793–95), he took part in the battle of the Nile (1798) and was with Nelson in the Baltic in 1801. In 1808 he became rear admiral; in 1812 was vice admiral; admiral in 1820, and in 1830 commander in chief at Portsmouth, where he died three years later. Consult Herbert, *Life and Services of Admiral Sir Thomas Foley* (Cardiff, 1884).

FOLGER, fŏl'jẽr, Charles James (1818–84). An American jurist and politician. He was born at Nantucket, Mass., graduated at Hobart College in 1836, and after 1840 practiced law at Geneva, N. Y., and was elected county judge of Ontario County in 1851. He was State Senator from 1861 to 1869, during which time he served as chairman of the Judiciary Committee, and for four years was president pro tempore. He became associate justice of the New York Court of Appeals in 1871 and in 1880 succeeded Judge Church as Chief Justice. He was Secretary of the Treasury in President Arthur's cabinet from 1881 until his death. As the Republican nominee for Governor of New York in 1882, at a time when the party was seriously divided, he was defeated by Grover Cleveland by an overwhelming majority.

FOLGER, Henry Clay, Jr. (1857–). An American capitalist, born in New York City. He received the degrees of A.B. in 1879 and A.M. in 1881 from Amherst College, and LL.B. (1881) from Columbia University. He was connected with the Standard Oil Company of New Jersey from 1879 to 1911, when he became president of the Standard Oil Company of New York. He was also chosen president of the Atlantic Refining Company and the Solar Refining Company and director of the Union Tank Line, the Tide Water Oil Company, and the Tide Water Pipe Company. He wrote several monographs on Shakespeare and collected a library of Shakespeareana, comprising some 20,000 volumes. In 1914 he received the degree of Litt.D. from Amherst College.

FOLGER, Peter (1617–90). An American colonist and clergyman. He was born probably at Norwich, England, and in 1635 settled in Watertown, Mass., whence he seems to have removed to Martha's Vineyard in 1641, where he was occupied as a school-teacher, a land surveyor, and an assistant to Thomas Mayhew in missionary work among the Indians. About 1663 he removed to Nantucket, where he acted as surveyor and interpreter, and for a short time as clerk of the courts. His daughter Abia was the mother of Benjamin Franklin. Folger was the author of a crude but vigorous work in verse, *A Looking-Glass for the Times; or, The Former Spirit of New England Revived in this Generation* (1676; reprinted, 1883), in which, addressing himself to the governors of the Colonies at the time, he advocates liberty of conscience and toleration of the Anabaptists, Quakers, and sects which had hitherto suffered persecution, and asserts that King Philip's War and other calamities are to be regarded as judgments of God for the absence of such toleration in the past. A reprint may be found in Stedman and Hutchinson, *Library of American Literature*, vol. i (New York, 1887).

FOLGER, William Mayhew (1844–1928). An American naval officer. He was born at Massillon, Ohio, and graduated from the United States Naval Academy in 1864. After serving in the various lower grades he became captain in 1898 and rear admiral in 1904. His commands include the *Quinnebaug* (1887–88), the *Yorktown* (1894–95), the *New Orleans* (1898–99), and the *Kearsarge* (1900–01). He was inspector of ordnance at the Washington Navy Yard in 1888–90, chief of the Bureau of Ordnance with the rank of commodore in 1890–93, and lighthouse inspector in 1896–98 and 1901–04. He also commanded the Philippine squadron in 1898 and until 1905 the Cruiser squadron of the Asiatic fleet, and the whole fleet at the time of his retirement in 1905.

FOLGORE DA SAN GEMINIANO, fôl'gô-rā dā sän jā'mē-nyä'nô. An Italian poet, who flourished about the close of the thirteenth century. Of his life little is known. He was a contemporary of Dante and a writer of sonnets, some of which have been translated into English by D. G. Rossetti and J. A. Symonds. He wrote a series of anti-Ghibelline political sonnets, which are of interest from their allusions to Italian life and society of the day, and two other series celebrating with Epicurean gayety the pleasures of the months and the days of the week. These latter are remarkable for their curious imagery and gentle satire and possess added interest from their relation to the joyous company described in Dante's *Inferno* (xxix, 130). Consult Rossetti, *Dante and his Circle* (London, 1874), and Navone, *Le rime di Folgore* (Bologna, 1880).

FOLIATION, fō'lĭ-ā'shŭn (from ML. *foliare*, to put forth leaves, from Lat. *folium*, Gk. *φύλλον, phyllon*, leaf). In geology, a term used to designate a parallel arrangement of mineral constituents in rocks, as in gneisses and schists. By some geologists it is distinguished from cleavage, schistosity, or slatiness; but this distinction is not based on essential differences. The foliation, or parallel arrangement, is most noticeable in the metamorphic rocks which have undergone powerful compression and which contain platy minerals like the micas. See Cleavage; Schistosity.

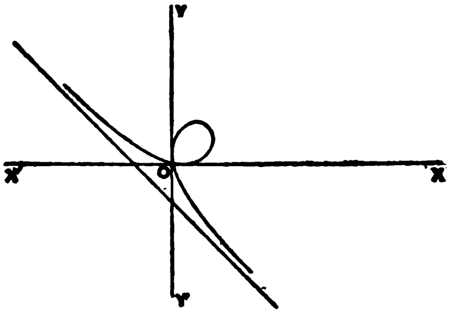
FOLIES-BERGÈRE, fô'lē' bĕr'zhâr'. A well-known amusement hall on the Rue Richer, Paris. It was founded in 1869 as a variety theatre and offers musical and acrobatic performances, dances, and similar entertainment.

FOLIGNO, fô-lē'nyô (Lat. *Fulginium*, *Fulginia*). An episcopal city in the Province of Perugia, central Italy, on the Topino, 771 feet above sea level, 80 miles southwest of Ancona (Map: Italy, D 3). In the Pinacoteca are Roman reliefs and paintings by Umbrian masters; in the church of Santa Maria infra Portas, which has an eighth-century portico, are numerous frescoes of the fifteenth century by Niccolò da Foligno, who was born here and was the head of the Foligno school of painting; in the church of San Niccolò are an altarpiece representing the Nativity and a "Coronation of the Virgin" by the same artist. The cathedral of San Feliziano has a thirteenth-century portal, fifteenth-century frescoes, and a few ninth-century columns. Near it the Orfini Palace contains a fresco by Perugino. Raphael's Madonna di Foligno, now in the Vatican, was painted for the church of St. Anna. In Bevagna, 5 miles to the west, are two twelfth-century churches, one of which has been restored as a national monument, and in the churches of the neighboring Montefalco are many of the best paintings of the Umbrian school. In Trevi, the ancient Trebia, 5 miles south of Foligno, there are also important paintings. Foligno has a large theatre, a gymnasium, a technical school, a seminary, and a chamber of commerce. It markets silk and oil, and manufactures machinery, leather, paper, and soap. The city was destroyed by the Perugians in 1281 and was ruled by the Trinci from 1305 to 1439, when it was annexed to the States of the Church. It was badly damaged by an earthquake in 1832. Pop. (commune), 1901, 26,111; 1911, 28,373.

FO'LIO (Lat., abl. sing. of *folium*, leaf). A sheet of paper that is folded once, or of a size convenient for so folding. Also a book formed of sheets so folded as to make two leaves. See Book.

FO'LIUM (Lat., leaf). A curve first studied by Descartes (q.v.). Its equation in rectangular coördinates is $x^3 + y^3 - 3axy = 0$; hence the curve is of the third order. (See Curve.) The origin is a double point, and the axes of coördinates are the tangents at this point. See figure, which shows the leaf-shaped loop which gives the curve its name.

The line $x + y + a = 0$ is an asymptote (q.v.), and its infinite point of contact is a real point of inflection.



FOLK, Joseph Wingate (1869-). An American lawyer and public official, born in Brownsville, Tenn. He graduated at Vanderbilt University in 1890, was admitted to the bar in the same year, and as circuit attorney (1900-04) became prominent for the vigor of his prosecution of bribery cases. He was elected Governor of Missouri in 1904 on the Democratic ticket—the only successful candidate on the State ticket—and in his term (1905-09) was active in the campaign against trust abuses. He was talked of in Missouri for the Democratic nomination for the presidency in 1912, but withdrew in favor of Champ Clark. In 1913 President Wilson named him solicitor of the Department of State, and in February, 1914, he was appointed counsel of the Interstate Commerce Commission.

FOLKES, fōks, Martin (1690-1754). An English antiquary, born in London, and educated at Clare College, Cambridge. While still young, he was elected a member of the Royal Society, and in 1741 he was chosen president. He was also president of the Antiquarian Society from 1749 until his death. He was a friend of Sir Isaac Newton and was distinguished for his extensive information. The works entitled *A Table of English Gold Coins from the Eighteenth Year of King Edward III* and *A Table of English Silver Coins from the Norman Conquest to the Present Time* were published by him at his own expense (1745) and reprinted by the Society of Antiquaries in 1763. He also contributed valuable papers on Roman antiquities to the *Transactions* of the Royal and Antiquarian societies.

FOLKESTONE, fōk'stŏn. A seaport and municipal borough in Kent, England, on the Strait of Dover, 7 miles west-southwest of Dover (Map: England, H 5). It is an ancient town, with Roman, Saxon, and Norman remains, and is built on uneven ground at the foot of a range of hills, the oldest part lying in a narrow valley crossed by a fine railway viaduct. Its extension and improvement date from the opening of the South-Eastern Railway, the establishment of a daily steamer service with Boulogne, and the enlargement of the harbor. It has important fishing interests and a considerable shipping trade, the total value of its imports and exports for 1912 amounting to $98,686,000. Folkestone has a promenade pier, amusement pavilion, and pleasure gardens, museum, and free library, and is a favorite sea-bathing resort. The electric-lighting and tramway service are furnished by a private company operating under an agreement with the corporation. The parish church, renovated and restored, was the priory church of St. Eanswith, built in 1095. A monument to Sir William Harvey (q.v.), discoverer of the circulation of the blood, born here in 1578, was erected in 1881. Pop., 1901, 30,694; 1911, 33,502.

FOLKLAND. See Folcland.

FOLK'LORE'. The learning of the uncultured; a branch of study that relates to traditional beliefs, old-time customs, usages, or observances preserved generally among the common people, and collects legends, myths, tales, folk songs and superstitions for the purpose of record and comparison. Oral tradition and unwritten practice are important elements in matters of folklore, and a certain amount of obsoleteness or obsolescence is characteristic of the subjects that come under consideration, for the learning of to-day becomes the lore of to-morrow, so that a full knowledge of the folklore of every nation of the world would be synonymous with the history of human thought. The word "folklore" as a designation is comparatively modern; it was first suggested by W. J. Thoms, in an article in the *Athenæum*, Aug. 22, 1846, as a connotation for what is often called popular antiquities.

With regard to its antiquity folklore studies date back as far as antiquarians themselves. The ancient Hindus, in their *Itihāsa* legends of the Vedas, and the Sanskrit myths and sagas of the *Purānas* (q.v.), recognized the fact, if not the form, of the study; and Herodotus and Livy were not blind to certain historic and traditional features in stories and observances among the common people which we to-day would chronicle as elements of folklore. But as a serious branch of investigation the study is comparatively recent. Yet we can recognize it distinctly, in spirit at least, as early as the opening of the eighteenth century. One of the first books of the kind to which we may point in England is Aubrey's *Miscellanies*, published in 1696. This contained much folklore material, as the work had chapters on day fatality, omens, dreams, corpse candles, second sight, and kindred subjects; but the author himself was much given to superstition, and he attached especial prominence to that phase of thought in the book. The first real work on the general subject of folklore was an octavo volume by the Rev. Henry Bourne, *Antiquitates Vulgares; or, The Antiquities of the Common People* (Newcastle, 1725). It consists largely of an account of popular customs connected with the feasts of the church. Addison, the essayist, also gave some attention incidentally to subjects in the line of folklore; but a marked step in advance was made when Brand's *Popular Antiquities of Great Britain* was issued at Newcastle in 1777, and became a standard work that has often been republished and revised. In Germany Herder and the brothers Grimm were pioneers in the way of folklore studies and were followed by such men as Adelbert Kuhn, Mannhardt, W. Schwartz, and Weinhold; for scientific method was brought into the study by the school of German workers. Among the Latin races the French point to the names of Ballard and Moncrif, Spain to Fernan Caballero and Machado y Alvarez, Italy to De Gubernatis and others, as interested in this theme; so that to-day every country in Europe, including Greece, has some laborers in this department, or supports a regular journal and series of publications connected with folklore topics.

In America especially there has been increasing interest in researches into the popular and traditional knowledge of the folk, because of the exceptional opportunities for studying the more or less savage and crude mass of primitive ideas and notions existing among the Indian tribes or preserved by the negro population. So widespread throughout the world is the interest in folklore that there is hardly a civilized or uncivilized race that has not received direct or indirect attention from some worker in the field. Associations for the study of folklore, like the English Folklore Society, founded in 1878, the French society for the study of popular traditions, with its *Revue des traditions populaires* (Paris, 1886–), the American Folklore Society, founded in 1888, and many others, these have helped largely to lift folklore studies out of the mere antiquarian stage and to make them a valuable auxiliary in anthropological and ethnological investigations.

As a branch of research, folklore is extremely comprehensive in its scope. Some idea of its breadth may be gathered from the following scheme of groups and subgroupings of topics arranged by the London Society of Folklore in its *Handbook*. The outline is as follows:

IDEAS AND SUPERSTITIOUS BELIEFS

1. Superstitious belief and practice.
2. Superstitions connected with great natural objects.
3. Tree and plant superstitions.
4. Animal superstitions.
5. Goblindom.
6. Witchcraft.
7. Leechcraft.
8. Magic and divination.
9. Beliefs relating to future life.
10. Superstitions generally.

TRADITIONAL CUSTOMS

11. Festival customs.
12. Ceremonial customs.
13. Games.
14. Local customs.

TRADITIONAL NARRATIVES

15. Nursery tales or Märchen; hero tales; drolls; fables and apologues.
16. Myths, relating to creation, deluge, fire, and doom.
17. Ballads and folk songs.
18. Place legends and traditions.

FOLK SAYINGS

19. Jingles, nursery rhymes, riddles, etc.
20. Proverbs.
21. Nicknames, place rhymes.

The themes of folklore may be: (1) cosmic phenomena and origins; (2) the heavenly bodies in their appearances and disappearances, their movements and associations; (3) physical and meteorological phenomena; (4) geographic features; (5) the plant kingdom; (6) the animal kingdom; (7) human beings in every possible state and activity, whether individually or collectively as a community; (8) the spirit world in association with man.

Those among whom the lore is to be found may be a tribe, a race or people, inhabitants of a region, a social class, or people representing a calling in life. Any or all of these themes of lore existing in any human group may be investigated in accordance with the folklore society's scheme, which takes in serious and seemingly trivial topics alike. The folklorist by his researches may advance our general knowledge of folk industries, folk æsthetics, and folk sociology. Scientific investigations of myths and their origin, or the tracing of the migrations of tales, have contributed information in respect to community of descent or with reference to interchange of ideas through geographical proximity or through emigration. These have their value to the ethnologist, or they show the anthropologist how similar conditions call forth similar phenomena, as in the matter of kindred nursery rhymes, or counting jingles, games, or customs, among totally unrelated peoples of the world.

A study which has yielded so much, and may yield such great results, deserves its recognition as a scientific branch of research, if pursued with proper equipment, thorough and correct method, and with judgment. In the earlier days the collectors naturally worked in the field as dilettanti, and there was a tendency to look upon the examples of myths, customs, superstitions, or belief, rather as curiosities than as telling some story of human civilization. There was too great an inclination to add to the attractiveness of the picture that was drawn by touching it up or giving it special color; there was a natural proneness to modernize the legend that was recorded, to introduce material, or make more up-to-date folk songs than were set down. One thing, above all, is now recognized as essential for the true folklorist: it is fidelity and scrupulous care in recording the matter, whatever it be, if he expects it to have any real scientific value. Special caution, moreover, and heed in drawing deductions are indispensable. For example, in accounting for folk thought and custom, especially the occurrence of the same phenomena in regions wide apart, among peoples of different race, or belonging to distinctly different types, the following cautions should be observed:

1. To be sure that the resemblance is actual and not superficial.
2. To keep in mind that sporadic resemblances may be purely accidental.
3. To remember that all mankind under similar environments has thoughts and ways in common, on the axiom that like causes produce like effects.
4. To recognize the fact that the more numerous the instances and the more complex the customs under consideration, the more certainly has there been acculturation of some kind; but caution must be observed in drawing deductions of blood relationship from similarities in sayings and arts.

Bibliography. The number of works, articles, or treatises on the various branches of folklore study is immense. For convenience simply, reference may be made to Gomme, *Handbook of Folklore* (London, 1887); id., *Ethnology in Folklore* (New York, 1892); Cox, *An Introduction to Folklore* (London, 1895). The best bibliographic lists may be obtained from consulting the *Journal of American Folklore*, published by the American Folklore Society (Boston and New York, 1888 et seq.); *Folklore*, being the transactions of the Folklore Society (London, 1890 et seq.); *Beiträge zur Volks- und Völkerkunde* (Berlin, 1893 et seq.); *Mélusine* (Paris, 1877 et seq.); *Biblioteca de las tradiciones españolas* (Madrid, 1881 et seq.); *Archivio per lo studio delle tradizioni popolari* (Palermo, 1881 et seq.); *Bulletin du Folklore* (Brussels, 1891); *Schweizerisches Archiv für Volkskunde* (Neuchâtel, 1897 et seq.). Consult also W. Carew Hazlitt, *Faiths and Folklore; Dictionary of National Beliefs* (a new edition of Brand's treatise, New York, 1905), and Eisenstädter, *Elementargedanke und Uebertragungstheorie in der Völkerkunde* (Stuttgart, 1912). See also Demonology; Folk Music; Man, Science of; Mortuary Customs.

FOLKMOOT. See Folcmot.

FOLK MUSIC. Music which is the outgrowth of a people's development, as opposed to *art music*, which owes its existence to the characteristic compositions of a few individuals. National music, however, may be, and generally is, based on the folk music of the country. Folk tunes are the wild flowers in the realm of music. They are valued to-day more highly than ever, both for their intrinsic beauty and as themes for composers with nationalistic tendencies. By way of supplementing the earlier collections of songs and dances made by private individuals, the governments of several European countries have in recent times borne the expense of gathering and printing whatever could be found of this indigenous folk music, while the inventive faculty of composers has been frequently rejuvenated, during the last eight centuries, at this inexhaustible fount of original melody. This is particularly noticeable in the case of Hungarian folk music, which has provided material not only for native composers, but also for Germans, especially those who made their home in Vienna. Haydn made good use of folk music, and in more recent times Liszt collected a great number of the Magyar melodies as played by the Gypsies, and used them as the themes for his Hungarian rhapsodies. Even Schubert, the most spontaneous of all melodists, was so struck by the charm of the Magyar melodies that he copied some of them and embodied them in his works. Brahms and others did the same thing. In Russia, Poland, Bohemia, and Scandinavia, Tschaikowsky, Chopin, Dvořák, Grieg, and many others adopted the melody of the people or fashioned their own in its image. Beethoven went to Scotland and Ireland for the melodies of some of his songs and to Russia for the themes of some of his chamber compositions. Nor have Oriental countries been ignored. Puccini traveled as far as Japan in one of his operas. Edgar Kelley wrote a Chinese suite, and Edward MacDowell an Indian suite based on aboriginal American melodies.

The lower the composer descends in the scale of civilization, the more refractory his borrowed material is apt to prove. While primitive music—the music of uncivilized peoples—also comes under the head of folk music, in the widest sense of the word, it is too different in character and too wide in scope to be treated of under this head. One misconception regarding it may, however, be corrected here. It is not true, as commonly assumed, that the vocal music of the lower races is always associated with words. The songs of savages are frequently songs without words or with words that have no meaning. But when we come to mediæval European folk song, we find that what Wagner wrote concerning it is true: "The word poem and the tone poem are one and the same thing. The people never think of singing their songs without words. . . . The two seem to belong together, like husband and wife." Owing to this close adaptation of the music to the words, the mediæval folk music is indeed more artistic than the art music of the ecclesiastical composers of the same period, who usually maltreated their words or buried them under a rank growth of contrapuntal artifices. Nor is this the only point of superiority. While the ecclesiastical composers were still hampered by the unwieldy church modes, folk music had instinctively adopted the modern major and minor modes and thus represented in its day the music of the future. Furthermore, it had much greater rhythmic variety, as well as more melodic originality and charm, so that it is not surprising that the church composers began, as early as the twelfth century, to adopt folk tunes as themes for their masses and motets. Too often they distorted them almost past recognition; but in the sixteenth century Luther had the courage to discard the monotonous Gregorian chants and substitute for them in church good folk songs, unaltered except as to the words. It is not difficult to understand why folk songs should have been, as a rule, more spontaneous than the art music of these early times. The church composers were hampered by artificial rules, and there were only a limited number of them, whereas the folk singers were countless in number and could do as they pleased. The assertion made in musical histories, that the folk songs of Europe were invented by the Troubadours (q.v.) and Minnesingers (q.v.) and from them passed to the people, is contrary to the facts. It was the Troubadours and Minnesingers who got many of their tunes from the people, and among the people they were a matter of slow growth. Few, perhaps, were the product of one mind. A man might spontaneously conceive a melody to give expression to his feelings of love or religious fervor or some other joyous or sad emotion; others would repeat it, with additions and improvements, until finally a perfect melody would be evolved—a melody that spoke to the hearts of all. Usually folk songs were sung as melodies only; in some cases harmonic parts were added.

Of all European countries, Germany probably has the greatest number and variety of good folk songs. Many collections of them have been printed, a list of which may be found in Engel's *The Literature of National Music* (London, 1879), a valuable guide for the student of this subject. As folk music is anonymous and not copyrighted, and as it frequently undergoes slight changes, it is not surprising that few of the old German tunes have come down to us unaltered. They were affected by contact with art music, which gradually wore off their rough edges and polished them; and since Germany has set the standard in modern music, it is easy to understand why its folk songs should for these reasons seem normal to us—i.e., deficient in those exotic traits which characterize the popular music of such countries as Russia, Scandinavia, and Hungary. Italy and France are in this matter in the same position as is Germany, because they, too, have helped to fix the modern musical standard. That does not make their folk songs any less admirable, but it prevents them from exercising so striking an influence on the art music of our time. Italy, the "land of song," has, strange to say, contributed little of great value to the world's stock of authentic folk music. There were, of course, in the olden times, plenty of *ballate*, *villanelle*, *frottole*, and other kinds of folk music; nor is there a lack of collections of what purport to be Italian folk songs, Neapolitan, Sicilian, Venetian, and so on; but in most cases it is impossible to tell whether these melodies were really invented by the people in true folk-music fashion, or whether they were taken from the thousands of operatic scores which have practically monopolized the musical interest of the Italians ever since the beginning of the seventeenth century. The best songs in Petrucci's collection, published in 1503, are taken from German, French, and other sources, and there is reason for the assertion made by Mrs. Wodehouse that "Italian musicians held the popular songs of other countries in higher estimation than their own." So far as Italian songs have harmonic accompaniments, they are apt to be simple and commonplace, avoiding modulation; and the songs are more interesting melodically than rhythmically.

In French folk music, also, no great attention is paid to harmony or accompaniment, but rhythmic variety and piquancy constitute a striking trait, and the words are apt to govern the tune, instead of vice versa, as in Italy. Among the French *airs*, *chansons*, *chants*, and *romances* there is plentiful variety of subject; many are witty, and political songs are popular. There are also *brunettes*, addressed to young girls, and other tender songs; but French folk music seldom is so soulful and romantic in its yearnings as the German, or so poignant in the expression of grief as the Russian or Scandinavian. In the neighboring country of Spain folk music has much more of an exotic character than in France, Italy, or Germany; nor is this surprising, since in that country, especially in Andalusia, the Moorish influence makes itself strongly felt. This is shown in the predominant use of song as an accompaniment to dancing, in quaintly Oriental melodic intervals, in the abundance of ornaments, and in the simultaneous use of several rhythms. But whether Oriental or purely Spanish, there is an ineffable charm in the national music of the Spanish people—the *jotas*, *boleros*, *fandangos*, *seguidillas*, *malagueñas*, etc. Bizet caught some of the charm of this music in his *Carmen;* and some day, if Spain ever gives birth to a Liszt, a Dvořák, or a Grieg, marvels of novel musical beauty may be expected.

While England has long been reputed an unmusical country—chiefly for the reason that, like Spain, it has never produced a composer of the first rank—there was a time when the people of that country were as musical as those of any other part of Europe, so far, at least, as the enjoyment and practice of music are concerned. There were always bards and minstrels, who were richly rewarded for their services, and in the dim past every man was apparently expected to be able to sing and accompany himself on the harp. What is most surprising about English music, both popular and professional, is that there is so little about it that is characteristically national. This is particularly true regarding instrumental music (of which all continental nations have such abundant variety) and folk song. It is only in concerted vocal music, the madrigal, and the glee, that we find a national flavor. The ballad is, indeed, also very much favored in England; the *Beggar's Opera*, with its 69 popular ballads and dance tunes, struck the keynote of English taste; yet in most instances the words of the English ballads have infinitely more merit and national character than the music. In Wales, Ireland, and Scotland, on the other hand, the popular music not only has a strong national flavor, but it is almost as exotic as that of the border lands of the European continent. The charms of Irish folk melodies have been made known to thousands by the association of a number of them with Moore's poems, and in more recent times through the collection made by Villiers Stanford, who also wrote an opera, *Shamus O'Brien*, full of quaint musical Hibernicisms.

Of Scotland's folk music there are almost as many collections as of Germany's, and they include many gems of the first water. The bagpipe is typical of Scottish folk music; it is not, as many suppose, an instrument on a level with the barrel organ, but has a great fascination for educated musicians, with its persistent drone and queer melodic intervals. Scottish music has a characteristic which it shares with the Chinese—the pentatonic (or five-tone) scale which omits the fourth and seventh tones of the ordinary diatonic scale; it can be amusingly imitated by playing only on the black keys of a piano. Scottish music also has a good deal in common with the folk music of Scandinavia, especially Norway. The Norwegian, Grieg, was partly of Scottish descent, and so is his music. Grieg did not, as so many writers have erroneously stated, habitually incorporate Norwegian folk melodies in his compositions. What he did was to write in the style and spirit of Norwegian folk music. This music shares the rugged, gloomy characteristics of Norwegian scenery and climate; it indulges in frequent capricious changes of rhythm and tempo, occasioned by the close alliance between the words and music; it evinces a preference for the minor mode; its tonality is often uncertain; and its melodic intervals are strange to our ears.

Similar traits are noted in the national melodies of Russia, which, according to Rubinstein, are equaled in charm only by those of Sweden and Norway, while César Cui claims for Russia supremacy over all countries. The typical Russian folk song is of limited compass, and this is probably attributable to the primitive instruments of the lute and violin families long in use. The prevailing mood of these songs is melancholy, but some of them are characterized by a wanton excess of animal spirits. Florid passages on one syllable occur, and the harmonies are apt to be bold and harsh. Liszt's ultramodern discords had no terrors for the Russian composers brought up on such food. Bohemian music is remarkable for its varied rhythms and great diversity of dances. Polish folk music is chiefly instrumental; its general traits are well known, owing to the wide diffusion of the works of Chopin, in which (especially the mazurkas) they are admirably reflected. The *tempo rubato*, or capricious and frequent change of time, is also an essential trait of Hungarian music, although its use in the mazurka differs widely from its application to the Gypsy csárdás (q.v.). Hungarian music has a scale of its own, with an augmented fourth that intensifies its melancholy. It is usually highly ornamented, and these ornaments were supplied by the Gypsies, while the melodies themselves are of Magyar origin. All these things go back to a remote antiquity. Folk music is never the growth of a few centuries: it requires ages and isolation, and this is why the New World, cosmopolitan America, has none.

Bibliography. The best series of articles on folk music are those by Krehbiel which appeared in the New York *Sunday Tribune* for July, August, September, and October, 1899. Consult also: Finck, *Songs and Song Writers* (New York, 1900); Parry, *The Evolution of the Art* *of Music* (ib., 1896); Wallaschek, *Primitive Music* (ib., 1893); Engel, *An Introduction to the Study of National Music* (London, 1886); Leland and Prince, *Popular Songs of the Algonquins* (New York, 1902); K. Breuer, *Das deutsche Volkslied* (Paderborn, 1908); R. Williams, *Folk-Songs of England* (London, 1908); A. Millien, *Chants et chansons recueillis* (Paris, 1908); E. Lineff, *The Peasant Songs of Great Russia* (St. Petersburg, 1908); H. Thuren, *Folkesangen* (Copenhagen, 1908, Danish and German); J. Meier, *Kunstlied und Volkslied in Deutschland* (Halle, 1906); G. Bantock, *One Hundred Folksongs of All Nations* (Boston, 1911); R. R. Whitehead, *Folksongs of Eastern Europe* (New York, 1912); J. L. Cahan, *Yiddish Folksongs* (2 vols., ib., 1912); H. E. Krehbiel, *Afro-American Folksongs* (ib., 1914).

FOLK PSYCHOLOGY. A science intimately related to psychology, sociology, and ethnology, dealing with the psychological phenomena due to man's gregarious mode of life. Folk psychology might thus logically coincide with sociology, but, as a matter of historical development, the existing science of sociology deals mainly with the social phenomena of the more advanced cultures, while folk psychology includes those of relatively primitive tribes as well. For the converse reason it is more inclusive than the science of ethnology in its present state, while, on the other hand, it does not deal at all with the purely historical problems that occupy the ethnologist's attention. Finally, folk psychology differs from psychology in analyzing the psychological manifestations, not of individuals, but of social groups. In practice, to be sure, these several sciences are not antagonistic, but mutually complementary. For example, the psychology of the individual is frequently intelligible only through a consideration of folk-psychological motives. Thus, most of the earlier and often ingenious speculations as to the origin of religion are worthless because they assume a direct reaction of the individual to the surrounding universe in which he finds himself. Folk psychology insists that religion is a social phenomenon, and that the individual's religious reactions are very largely determined by the preëxisting religious concepts of his social group. Wundt recognizes three subjects of inquiry that are peculiarly amenable to folk-psychological treatment—language, religion, and custom—for no one of them is conceivable except as due to the interaction of distinct individuals. Consult: *L'Année sociologique*, ed. by Durkheim (Paris, 1896–); *Zeitschrift für Völkerpsychologie und Sprachgeschichte*, ed. by Lazarus und Steinthal (20 vols., Berlin, 1860–90); Lévy-Bruhl, *Les fonctions mentales des sociétés inférieures* (Paris, 1910); Wundt, *Völkerpsychologie* (Leipzig, 1900); id., *Elemente der Völkerpsychologie* (ib., 1912).

FOLK'RIGHT. The body of customs recognized as having the force of law in early English history. As used by the Norman kings, the expression has reference to the native law and custom, as distinguished from the rules and observances introduced by the Conqueror and his followers. Later, the term is synonymous with the expression "common law," by which it was soon superseded. Consult the authorities referred to under ANGLO-SAXON LAW.

FOLKS, fōks, HOMER (1867–). An American sociologist, born in Hanover, Mich. He was educated at Albion College (Michigan) and at Harvard, where he graduated in 1890. From 1890 to 1893 he was secretary of the Children's Aid Society of Pennsylvania and from 1893 to 1902 secretary of the New York State Charities Aid Association. He was elected to the New York City Board of Aldermen as an anti-Tammany member in 1897 and 1898, and was an unsuccessful candidate for the State Assembly in 1899. In the spring of 1900 he went to Cuba to assist the United States military authorities in reorganizing the public charities of the island; in 1902–03 he was Commissioner of Charities for New York City. He was president of the New York State Probation Commission after 1907, and in 1911 president of the National Conference of Charities and Correction, in which he had been prominent for many years. His literary work includes the editing of the *Charities Review*, numerous reports and magazine articles, *The Care of Destitute, Neglected, and Delinquent Children* (1902), and *Problems in the Administration of Municipal Charities* (1904).

FOL'LEN, AUGUST, afterward ADOLF LUDWIG (1794–1855). A German poet and patriot. He was born in Giessen, Jan. 21, 1794. He was imprisoned (1819–21) for political agitation in Berlin and after his release spent his life in Switzerland. He died in Bern, Dec. 26, 1855. He is known for his anthology of German poetry, *Bildersaal deutscher Dichtung* (1827), but also for *Das Nibelungenlied im Tone unserer Volkslieder*, I. Teil, Siegfrieds Tod (1843) and *Tristans Eltern*, a romantic epic in 20 cantos, for a collection of *Latin Hymns* (1819), and for translations of the *Homeric Hymns* (1814) and Tasso's *Jerusalem Delivered* (1819). His chivalrous romances, e.g., *Malegys und Vivian* (1829), and his poems, with few exceptions, are not important. He deserves much credit for helping Gottfried Keller at the beginning of the latter's career.

FOLLEN, CHARLES THEODORE CHRISTIAN (1795–1840). A German clergyman, scholar, and reformer, brother of the preceding. He was born at Romrod in Hesse-Darmstadt and studied theology at Giessen, where he showed himself an ardent believer in the principles of the French Revolution. After some weeks of soldiering against Napoleon in 1814, he returned to his studies and in 1818 received an appointment as university lecturer in law. His revolutionary views, however, expressed in radical songs and inflammatory addresses, drove him from Giessen to Jena and thence to France, to Coire in Switzerland, to Basel, where he was appointed lecturer at the university, and finally, in 1824, to America. In 1825 he was appointed a teacher of German at Harvard College and three years later became teacher of ecclesiastical history and ethics in the divinity school. From 1830 to 1835 he was professor of German literature at Harvard. He was dropped from the Harvard faculty in 1835 because of his abolitionist sentiments. Later on he preached in the First Unitarian Church of New York City and in 1839 accepted a call to the pastorate of a church of the same denomination in Lexington, Mass. From the commencement of the antislavery movement he was an avowed Abolitionist and a warm friend and associate of Garrison. He lost his life in the burning of the steamboat *Lexington* on Long Island Sound, Jan. 13, 1840. His works, with a *Memoir*, were published at Boston in 1841.

FOLLEN, Eliza Lee (Cabot) (1787-1860). An American author, born in Boston, Mass., a friend of William Ellery Channing, and a stanch Abolitionist. Her writings were at one time very popular and include, besides a *Memoir* (1842) of her husband, Prof. Charles Theodore Follen, *Well-Spent Hours* (1827); *Poems on Occasional Topics* (1839); *To Mothers in the Free States* (1855); *Anti-Slavery Hymns and Songs* (1855).

FOL'LETT, Sir William Webb (1798-1845). An English lawyer and politician, born at Topsham, near Exeter. After studying at Trinity College, Cambridge, and at the Inner Temple, he commenced practice as a pleader in 1821 and was called to the bar in 1824, where his success was immediate and his progress rapid. In 1835 he was returned to Parliament for Exeter and soon gained distinction. Under Sir Robert Peel (1834 and 1841) he served as Solicitor-General. In 1835 he was knighted and in 1844 succeeded Sir Frederick Pollock as Attorney-General, but, his health having failed, he was forced to give up practice. As an advocate, he was lucid and persuasive, though never eloquent. A statue of him by Behnes is in Westminster Abbey.

FOLLEVILLE, fôl'vēl', Gabriel Guyot de (1760-94). A French priest, who took an important part in the Revolution. He was born in Brittany and studied law, but on the outbreak of the Revolution decided to enter the Church. He became curate of Dol in the spring of 1790; in 1791 he retracted his oath to the civil constitution and was forced to flee to Paris by his disgusted parishioners. But after the Tenth of August he left Paris, went to Poitiers, and there began his remarkable career of deceit. Going to the convent of the Filles de la Sagesse, he announced himself as a papal delegate and Bishop of Agra and became one of the leading Jacobins of the town. In 1793 the "Bishop of Agra" was made the head of the ecclesiastical council of Saint-Laurent-Sur-Sèvre, then of the administrative and judicial councils of another department. Abbé Bernier, of Saint-Laud, jealous of Folleville, made inquiries in Rome about him and learned that there was no Bishop of Agra. After the defeat of Le Mans he was captured, taken to Angers, recognized, tried, and guillotined. Consult Chassin, *La préparation de la guerre de Vendée* (1892) and Bossard, *L'Invention de l'évêque d'Agra* (1893).

FOL'LICLE (Lat. *folliculus*, dim. of *follis*, bag; probably connected ultimately with OHG. *ballo*, Ger. *Ball*, Icel. *bollr*, Eng. *ball*). A dry fruit or pod, composed of a single carpel, and opening by splitting down one side, as that of the peony. See Fruit.

FOLLIS. See Ball.

FOLQUET DE MARSEILLE, fôl'kā' de mär-sā'y' (1155-1231). A Provençal poet and troubadour. He was born in Marseilles of wealthy parents, but chose the roving life of a minstrel, traveled from court to castle, reciting his verses, making love to noble ladies, and composing in their honor poems which evidenced genuine feeling. When nearly 40 years old he experienced a change of heart, entered the Church, and by 1203 was Bishop of Toulouse and a strenuous persecutor of heretics. Because of the asceticism of his later years the looseness of his early life was so far overlooked that Dante awarded him a place in *Paradiso* (canto ix). Thirty of his poems remain, but there is no modern edition of them.

FOL'SOM, Charles (1794-1872). An American scholar and editor, born at Exeter, N. H. He graduated in 1813 at Harvard, and in 1816 became a chaplain in the United States navy, and midshipmen's instructor in mathematics on board the *Washington*. In the latter capacity he had David G. Farragut as one of his pupils. From 1821 to 1826 he was at Harvard, as a tutor in 1821-23, as librarian in 1823-26, and also as instructor in Italian in 1825. He was subsequently a partner in the firm of Folsom, Wells & Thurston, printers, and superintended the publication of classical works for Harvard. In 1824 he was an editor of the *United States Literary Gazette* with W. C. Bryant, and in 1833 of the *Select Journal of Foreign Periodical Literature* with Andrews Norton. His publications were annotated editions of *Cicero's Select Orations* (1811) and of *Additional Selections from Livy* (1829).

FOLSOM, Charles Follen (1842-1907). An American physician, born at Haverhill, Mass. He graduated at Harvard in 1862; from 1862 to 1865 was an instructor among the freedmen of the South; in 1870 graduated at the Harvard Medical School, and subsequently practiced medicine in Boston. In 1873-75 he studied at the universities of Vienna, Berlin, and Munich; from 1877 to 1885 was lecturer on hygiene at Harvard, and from 1879 to 1882 lecturer in and assistant professor of mental diseases. In 1882 he became a member of the National Board of Health, Lunacy, and Charity. His writings include *Mental Diseases* and *The Present Aspect of the Sewage Question as Applied to Boston* (1877).

FOLSOM, George (1802-69). An American antiquary, born at Kennebunk, Me. He graduated in 1822 at Harvard, was subsequently admitted to the bar, and practiced law at Worcester, Mass. In 1837 he removed to New York City, in 1844 was elected to the New York State Senate, and from 1850 to 1854 was chargé d'affaires to Holland. He was a member of the New York Historical Society and at one time president of the American Ethnological Society. He published *Sketches of Saco and Biddeford* (1830); *Dutch Annals of New York* (1841); *Mexico in 1842* (1842); *Letters and Dispatches of Cortez* (1843); *Documents Relating to the Early History of Maine* (1858).

FOLSOM, Nathaniel (1726-90). An American Revolutionary soldier and legislator, born in Exeter, N. H. He commanded a company of New Hampshire militia in the French and Indian War, served under Sir William Johnson at Fort Edward, and participated in the defeat and capture of Baron Dieskau in 1755. At the outbreak of the Revolution he was commissioned a brigadier general of New Hampshire volunteers, served at the siege of Boston, and was promoted a major general by the Council of New Hampshire and served as such throughout the war. He was a delegate from New Hampshire to the Continental Congress in 1774 and again in 1777 and 1778-80. In 1783 he was president of the New Hampshire Constitutional Convention.

FOLSOM CITY. A city in Sacramento Co., Cal., 22 miles by rail northeast of Sacramento, on the Southern Pacific Railroad, and on the American River (Map: California, D 4). The city enjoyed great prosperity in the early gold-mining days of California, and one of the State prisons is now situated near here. The chief industries are gold dredging, fruit and stock raising, dairying, and the manufacture of crushed-rock products. Pop., 1914 (local est.), 1500.

FOLTZ, fōlts, Philipp (1805–77). A German historical painter, born at Bingen. He was the pupil of his father, Ludwig Foltz, and studied at Munich under Cornelius, whom he assisted with the frescoes in the Glyptothek. Afterward he decorated the Schiller Salon in the new Royal Palace. He became professor and later (1870) director of the Academy of Munich. Among his latest works were two large paintings for the Maximilianeum: "Frederick Barbarossa and Henry the Lion," and "Pericles Attacked by Cleon." His pictures include two large hunting scenes for Maximilian II; "The Singer's Curse" (Munich Pinakothek); "Götz von Berlichingen" (Vienna Gallery); and "King Otho Leaving Munich for Greece," a fine cartoon. His pictures are good in composition and careful in execution, but conventional in form and dry in color.

FOL'WELL, William Watts (1833–). An American educator, born at Romulus, Seneca Co., N. Y. He graduated in 1857 at Hobart College, where, two years later, he was appointed adjunct professor of mathematics. In 1860–61 he studied philology at the University of Berlin. When he returned to the United States he enlisted in the Fiftieth New York Volunteers (engineers) and attained the brevet rank of lieutenant colonel. Subsequently he was professor of mathematics at Kenyon College (1869), president of the University of Minnesota (1869–84), and professor of political economy at the latter institution (1871–1907). His publications include *Public Instruction in Minnesota* (1875), and *University Addresses* (1909).

FOLZ, fōlts, Hans (c.1478–c.1515). One of the famous Meistersingers. He is said to have been born at Worms, Germany, and spent the greater part of his life in Nuremberg, where he worked as a barber-surgeon. His serious songs are spirited and moral in tone, but his *Fastnachspiele* (farces) are quite the reverse.

FOMENTA'TION (from Lat. *fomentatio*, from *fomentare*, to foment, from *fomentum*, fomentation, from *fovere*, to keep warm). An application of warmth and moisture to a part by means of cloths wrung out of hot water, sometimes medicated infusions of vegetable substances, calculated to relieve pain or stimulate the surface. Thus, opium, belladonna, chamomile, turpentine, etc., are used in various forms in connection with fomentations, which are of very great service in the treatment of several painful local disorders.

FONBLANQUE, fŏn-blăṅk', Albany (1793–1872). An English journalist. He was born in London in 1793 and first studied for the bar, but afterward drifted into journalism. As leader writer (1826–30) and as editor (1830–47) of the *Examiner*, the leading Liberal weekly journal of the time, Fonblanque exhibited a singular keenness of both wit and intellect and exercised great influence. In 1837 he republished in book form a selection from his leading articles, under the title *England under Seven Administrations*. In 1847 he relinquished the editorship of the *Examiner* and entered the statistical department of the Board of Trade. Consult *The Life and Labors of Albany Fonblanque* (London, 1874), a collection of articles edited by Fonblanque's nephew, E. B. de Fonblanque, and preceded by a biographical introduction from the pen of the latter.

FONCIN, fŏn'săn', Pierre François Charles (1841–). A French geographer and educator, born at Limoges. He studied at the Ecole Normale of Paris, and in 1876 became professor of geography in the faculty of letters at Bordeaux. In 1879 he was appointed director of the Douai Academy, in 1881 director of secondary education in the Ministry of Public Instruction, and in 1882 inspector general of secondary education. He was a founder of the Alliance Française, of which he became successively general secretary and president. His publications include: *Textes et récits d'histoire de France* (1872), for use in primary schools; *La prémière année de géographie* (1874); a *Géographie générale* (1887); *Le pays de France* (new ed., 1902); *France*, trans. by H. H. Kane (1902).

FON'DA. A village and the county seat of Montgomery Co., N. Y., 27 miles west-northwest of Schenectady, on the Mohawk River, the State Barge Canal, and on the New York Central and Hudson River and the Fonda, Johnstown, and Gloversville railroads (Map: New York, F 5). Fonda contains a public bathhouse with mineral water, and an industrial school for girls. It is the centre of an agricultural region, containing large ginseng gardens. There are knitting and flouring mills, a broom factory, silk mills, machine shop, bottling works, etc. The water works are owned by the village. Pop., 1900, 1145; 1910, 1100.

FOND DU LAC, fŏn' dụ lăk' (Fr., further end of the lake; so called from the situation of the city). A city and the county seat of Fond du Lac Co., Wis., 58 miles north by west of Milwaukee, on Lake Winnebago, at the mouth of the Fond du Lac River, and on the Chicago and North-Western, the Minneapolis, St. Paul, and Sault Ste. Marie, and the Chicago, Milwaukee, and St. Paul railroads (Map: Wisconsin, E 5). Through Lake Winnebago and Fox River there is communication by water with the Great Lakes. The city is picturesquely situated and has the Grafton Hall School for Girls (Protestant Episcopal), St. Agnes Hospital and Sanatorium, St. Mary's Springs Academy (Catholic), State women's reformatory, a public library, and Lakeside and Taylor parks. The leading manufactures are leather, lumber, refrigerators, typewriters, mill machinery, furniture, caskets, saw-mill machinery, candy, drugs, and butter and cheese. Fond du Lac was settled in 1836 and was incorporated as a village in 1847 and chartered as a city in 1852. It adopted the commission form of government in 1914. Pop., 1900, 15,110; 1910, 18,797; 1914 (U. S. est.), 20,367; 1920, 23,427.

FONDI, fŏn'dē. The ancient Fundi, a town in south Italy, in the Province of Caserta, 7 miles from the sea and 87 miles southeast of Rome on the ancient Appian Way (Map: Italy, D 4). The ruins of the castle, which in the sixteenth century belonged to the Colonnas, and town walls testify to its former splendor. In the Gothic church of Santa Maria there are some eleventh-century mosaics. Thomas Aquinas once taught in the chapel of the Dominican monastery. Fondi was burned by the Saracens in 846, laid waste in 1534 by the pirate Khair-ed-Din (Barbarossa), as the church records show, and again destroyed in 1594 by the Turks. Fondi marks the northernmost point in Italy where the extensive growth of oranges and lemons is now carried on. The wine of Fondi is praised in the writings of Horace and Martial. Lago di Fondi, the lake in the valley near the town, was known in classical times as Lacus Amyclanus. Pop. (commune), 1901, 9930; 1911, 11,378.

FONNI, fôn'nā. The highest town in Sardinia, located 21 miles south of Nuoro in the province of Sassari. At a little to the north of the town are located the remains of the ancient Roman Station Sarabale, mentioned in the *Antonine Itinerary* as being 87 miles from Carales on the way to Olbia. The buildings were grouped around a courtyard about 100 feet square. In the neighborhood of Fonni are the remains of stone age monuments known as *menhirs* and *nuraghi*. Pop., 1911, 4315.

FONSAGRADA, fôn'sȧ-grä'Dȧ. A town in the Province of Lugo, Spain, about 25 miles east by north of Lugo (Map: Spain, B 1). It is situated in a mountainous region, with fertile valleys, and is engaged principally in stock raising, dairying, and agriculture. There are some manufactures. Pop., 1900, 17,448; 1910, 19,219.

FONS EBRALDI. See FONTEVRAULT.

FONSECA, fôn-sā'kȧ, ANTONIO MANOEL DA (1796-1893). A Portuguese historical and portrait painter. Born at Lisbon, he studied at the Academy of that city under Sousa Loureiro, afterward became a professor in the Academy, and in 1830 was appointed court painter. In 1852 he was elected a corresponding member of the Academy of Fine Arts at Paris. Many of his works were exhibited at the Paris expositions of 1855 and 1867. They include chiefly historical scenes, such as "The Death of Albuquerque," "Christ in the Midst of the Doctors," "Christ Driving the Money-Changers from the Temple," and portraits of the Portuguese Kings, including Ferdinand and Pedro V.

FONSECA, GULF OF; also known as the Gulf of Amapala (called *Choroteg a* by the American Indians). An inlet of the Pacific ocean, situated in a volcanic region between the three Central American states of Salvador, Honduras, and Nicaragua (Map: Central America, D 4). It is nearly 20 miles long and over 40 miles wide, containing a number of islands, and receives the waters of numerous rivers.

FONSECA, JUAN RODRÍGUEZ DE. See RODRÍGUEZ DE FONSECA, JUAN.

FONSECA, MANOEL DEODORO DA (1827-92). The first President of the Republic of Brazil. He was born at Alagoas, Brazil, was educated at the military school at Rio de Janeiro, and was commissioned a lieutenant of artillery in 1849. He took a prominent part in the war with Paraguay in 1868-70 and was promoted to the rank of division general. About 1881 he became imbued with republican ideas and organized the Military Club at Rio de Janeiro. Fonseca's activity and pronounced republicanism, although he was a warm personal friend of the Emperor, Dom Pedro, finally led in 1887 to his appointment as Governor of a frontier province, in order to remove him from the capital, where his influence was thought to be dangerous. Having returned to Rio de Janeiro in 1889, he entered actively into the schemes of the Republicans in army circles and in the newly established Republican League, which culminated, on November 15 of that year, in the dethronement of Dom Pedro and the establishment of the Republic of Brazil. Fonseca was chosen head of the provisional government. The new constitution was proclaimed on Feb. 24, 1891, and on the same day Fonseca was elected to a four years' term as the first President of the Republic. He became almost immediately involved in conflicts with the national Congress, which increased in bitterness until he finally, on Nov. 3, 1891, dissolved Congress and proclaimed himself Dictator, placing the capital under martial law. The navy, remaining faithful to the Constitutional party, turned the tide against him, and on November 23 the army also declared against him, and, finding himself deserted, he resigned and took no further part in public affairs.

FONSECA, PEDRO DA (1528-99). A Portuguese philosopher and theologian of the Jesuit Order, often called the *Portuguese Aristotle*. He was born at Cortizada and was educated at the Jesuit chapter house at Coimbra and at the University of Evora, whence he returned to Coimbra as professor of philosophy. He rose high in his order, was Portuguese Minister in the reign of Philip II, and was charged with several important missions by Gregory XIII. In letters he is best known for his studies of Aristotle—*Institutiones Dialecticæ* (1564), *In Libros Metaphysicorum Aristotelis* (1577), and *Isagoge Philosophica* (1591). In dogma he made himself a name by his stress on God's prevision, and the attempt, further carried out by Molina, his pupil, to obviate the apparent clash between predestination and free will.

FONSECA BENEVIDES, bā'nā-vē'dās, FRANCISCO DA (1835-). A Portuguese scientist and author. He was born at Lisbon, the son of a physician, and studied medicine. He entered the navy in 1851, at the age of 19 became professor of physics in the industrial school at Lisbon, and a year later (1855) entered the faculty of the Naval Academy. He was made a member of the Lisbon Academy in 1866 and was sent by the government to various national expositions, and he exhibited some of his scientific apparatus at Paris in 1878. In 1884 he was made inspector of the Portuguese industrial schools. He founded the Lisbon Industrial Museum. Besides his contributions to Portuguese technical journals, he wrote: *Curso de artilheria* (1850); *Curso de physica* (1863); *Relatorio sobre a exposição de Paris em 1867* (1867); *Principios de optica* (1868); *O Fogo* (1869); *Noções de physica moderna* (2d ed., 1880); *Elementos de balistica* (2d ed., 1882); *Mémoire sur la vitesse de propagation des flammes* (1880); and the historical work, *As rainhas de Portugal* (2 vols., 1878-79)—all published in Lisbon. Consult I. F. da Silva, *Diccionario bibliographico portuguez*, vol. ix (Lisbon, 1870).

FONSECA LIMA E SILVA, lē'mȧ ā sēl'vȧ, MANOEL DA (1793-1862). A Brazilian soldier and politician, born at Rio de Janeiro. He entered the army, joined the movement for independence, and was commissioned lieutenant colonel and appointed Lord Chamberlain to the Emperor Pedro I. In 1828 he was promoted to the rank of brigadier. A man of Liberal ideas, he took part in the movement which forced the abdication of Pedro I and was appointed Minister of War in 1831 and again in 1835. He was Acting Minister of the Navy in 1835-36, and Minister of the Interior in 1836-37. In 1844 he was elected President of the State of São Paulo and in 1847 to the National Senate. In 1851 he was made lieutenant general, performing special services in connection with the army.

FONS SANA. See Fossano.

FONT (Lat. *fons*, fountain; probably connected ultimately with *fundere*, Gk. χειν, *chein*, Goth. *giutan*, AS. *gēotan*, OHG. *giozan*, Ger. *giessen*, Skt. *hu*, to pour). The vessel used in churches as the repository of the baptismal water. In the early Christian period, while immersion continued to be the ordinary form of the administration of the sacrament of baptism, the baptistery (q.v.), or other place set apart for the ceremony, was furnished with a basin sufficiently capacious to admit of the administration of the rite. But when it became customary to baptize by pouring the water on the head of the person to be baptized, the size of the basin was naturally diminished, and eventually it assumed the dimensions and the form which are now familiar to us in most of the mediæval churches in Great Britain and upon the Continent, thus doing away with the necessity for a separate building to contain it.

The earliest traditional example of a baptismal font is the great porphyry basin in the baptistery of Constantine in Rome, supposed since the early Middle Ages to have been that in which the Emperor was baptized. The baptismal font in its original form, as found in early baptisteries from the fourth to the tenth century, consists of a large basin, usually of octagonal form, with three steps, set below the pavement of the building, like the piscina of the Roman baths, and surrounded by a high veil (see Baptistery.) During the Romanesque period a radical change took place. The basin was raised above the floor level and instead of being built up was usually hollowed out of a single block of marble, the exterior surface, between 3 and 4 feet high, being carved with appropriate religious subjects in relief. The North European schools were famous for their large bronze fonts, preëminent among which are those of Lambert Patras for St. Bartholomew at Liége and for the cathedral of Merseburg. Such fonts averaged from 8 to 12 feet in diameter. The fonts for baptism by affusion are smaller basins, raised on a base. They are of varying form: square, octagonal, cylindrical, hexagonal, the interior bowl being always round and seldom exceeding 2 feet in diameter. The bowl was supported usually by a heavy cylindrical shaft, often flanked by four or more minor shafts, sometimes by a square pier. As the Gothic period advanced, fonts became of decreasing importance and size and of simpler decoration.

In the Roman Catholic church the preparation and consecration of the water to be used in baptism constitute an imposing ceremonial. With a view to the preservation of the water thus consecrated, the font, especially when it is of porous stone, is sometimes lined with lead; and from an early date it is furnished with a lid, often of a highly ornamental character and secured by a lock. Among notable Renaissance fonts one of the most beautiful is in the baptistery under the cathedral of Siena. The ordinary place of the font is at the western end of the nave, near the entrance of the church, but in many cases it stands in a separate chapel, or a baptistery, or at least in a compartment screened off for the purpose. Even when it stands in the open nave it is properly inclosed by a rail. See Baptism; Baptistery. Consult: Paley, *Illustrations of Baptismal Fonts* (London, 1844); Simpson, *Series of Ancient Baptismal Fonts* (ib., 1828); Corblet, *Histoire du sacrement du baptême* (Paris, 1882); Bond, *Fonts and Font Covers* (London, 1908).

FONTAINE, fôɴ'tăn', Charles (1513-89). A French poet. He was born in Paris, but lived in Lyons for the greater part of his life. Devoted to poetry from his boyhood, his first published work of any importance was *Le Quintil Horatien* (1551), wherein with conservative enthusiasm he opposed the more advanced school of poets forming the "Pléiade." His other published works are: *Les ruisseaux de Fontaine* (1555); a translation of *Vingt et une épîtres d'Ovide* (2 vols., 1556); *Les dicts des sept sages* (1557); *Odes, énigmes et épigrammes* (1557).

FONTAINE, Jean de la. See La Fontaine, Jean de.

FONTAINE, Pierre François Léonard (1762-1853). A French architect. When young, he went to Rome, where his connection with Percier (q.v.) began, which lasted for many years. Under Napoleon they restored the Imperial châteaux and palaces (Saint-Cloud, Versailles, Compiègne, Louvre, Tuileries) and built the Carrousel Arch of Triumph. The partnership having been dissolved on the fall of Napoleon, Fontaine remained court architect under Louis XVIII, Charles X, and Louis Philippe. He laid out the Rue de Rivoli, built the Chapelle Expiatoire, and enlarged the Palais Royal. He published a number of architectural books, with Percier and alone.

FONTAINEBLEAU, fôɴ'tăn'blō'. A town of northern France, capital of an arrondissement in the Department of Seine-et-Marne, beautifully situated in the midst of an extensive forest, nearly 2 miles from the left bank of the Seine, 35 miles southeast of Paris (Map: France, N., H 4). The forest of Fontainebleau, bounded on the northeast by the windings of the Seine and covering an area of nearly 66 square miles, is renowned for its beauty and is regarded as one of the most picturesque parts of France. It was seriously damaged by fire in 1911. On the northwest edge of the forest is Barbizon, made famous by Millet, Corot, and Rousseau. In the town there are two hospitals, a library, a theatre, and monuments to President Carnot and Rosa Bonheur, the latter designed by the artist herself. Since 1875 the military academy for engineers and artillery officers has been stationed here. Grapes, famous for their fine quality, are cultivated; porcelain, lumber, gloves, and earthenware are manufactured. Pop. (commune), 1901, 14,160; 1911, 14,679. The President of the Republic frequently resides here during the summer months.

Fontainebleau is chiefly famous for its château, or pleasure palace, of the kings of France. It is said to have been orginally founded by Robert the Pious towards the end of the tenth century. It was rebuilt in the twelfth century by Louis VII, of whom it was a favorite residence and hunting seat. It was enlarged by Louis IX and his successors.

The original castle was razed in 1527 by Francis I, who planned a pleasure palace less grim and more in harmony with the new life of the Renaissance. The plans were drawn up in 1528, probably by Gilles le Breton, who only partly carried them out in the Cour du Cheval Blanc, the Galerie de François I, the Galerie d'Henri II, and the peristyle of the Cour Ovale. The main portions were built shortly afterward by Pierre Chambige and Pierre Gérard. Under Henry II Philibert Delorme made additions, and the famous Italian artists, such as Primaticcio, Rosso dei Rossi, and Serlio, were called to build and decorate. Their work here was so important as to give to this little group of artists the name of the school of Fontainebleau, whose influence spread widely over France. Royal favor of Henry II was withdrawn, to be revived under Henry IV, for whom were executed the new Galerie de Diane, the Place d'Armes, and the beautiful park about the palace. To Louis XIII considerable interior decoration was due. Under Louis XIV the palace was occupied by Madame de Montespan, but later the King deserted it for Versailles and Saint-Germain, making it his autumn residence. It was again transformed under Louis XV and occupied successively by Madame de Pompadour and Madame du Barry; under Louis XVI it was a favorite residence of Marie Antoinette. Napoleon I had the palace renovated at a cost of 12,000,000 francs, and Louis Philippe restored it in the style of the sixteenth century. The palace contains many famous paintings by Vien, Brenet, Barthélemy, Boucher, Vanloo, Le Brun, Blondel, Hallé, Cotelle, and Dubois, also a library of 30,000 volumes and a Chinese museum.

Notwithstanding the later modifications the palace of Fontainebleau remains, in both construction and decoration, one of the most superb works of the early and golden ages of the French Renaissance, with a tinge of special Italian influence. In the seventeenth century it was the residence of Christina of Sweden after her abdication; the revocation of the Edict of Nantes was signed here in 1685; here for nearly two years Pope Pius VII was detained a prisoner by Napoleon. Many state transactions and treaties are dated from Fontainebleau. In the palace Napoleon signed his abdication in 1814 and again in 1815. The palace has been restored and is kept in perfect condition as a public monument.

Bibliography. Pfnor, *Histoire et guide artistique au palais de Fontainebleau* (Paris, 1889); *Architecture et decoration au palais de Fontainebleau* (ib., 1885); Palustre, *La Renaissance en France*, vol. i (ib., 1879); Haynes-Williams, *Fontainebleau* (New York, 1890), consisting of photogravures; E. Bourges, *Recherches sur Fontainebleau* (Fontainebleau, 1896); J. Roussel, *La palais de Fontainebleau* (Paris, 1899); Tarsot and Charlot, *Le château de Fontainebleau* (ib., 1900); R. E. Prothero, *The Pleasant Land of France* (New York, 1908); F. Hamel, *Fair Women at Fontainebleau* (ib., 1909).

FONTAINEBLEAU, SCHOOL OF. A group of artists assembled by Francis I at Fontainebleau, where they were chiefly employed in decorating the palace. There were two branches of the school, one of which was composed of the native artists, of whom the Clouets (q.v.) were the most important, and who were Flemish in technic. The other branch was composed of Italians. Francis invited Leonardo da Vinci to France (1516–19), but he died too soon to make his influence permanently felt. The chief founders of the school of Fontainebleau were Rosso dei Rossi (1495–1541) and Primaticcio (1504–70), both Bolognese mannerists. Their successors in the decoration of the palace, whether Netherlanders or French, labored in the same Italian style, which soon completely dominated French painting. The most prominent French representatives of the school were Jean Cousin (?1500–80) and Toussaint du Breuil (1561–1602). (See PAINTING.) The painters of Barbizon (q.v.) are sometimes called the school of Fontainebleau (or Fontainebleau-Barbizon), because most of their subjects were taken from the forest of Fontainebleau, near which the village of Barbizon lies. Consult: Dimier, *French Painting in the Sixteenth Century* (London, 1904); Mülbe, *Die erste Schule von Fontainebleau* (Breslau, 1904); Herbert, *Extraits d'actes et notes concernant des artistes de Fontainebleau* (2 vols., Fontainebleau, 1900–04); Smith, *Barbizon Days* (New York, 1902).

FONTAINE POWDER. See EXPLOSIVES.

FONTAN, fôɴ′täɴ′, LOUIS MARIE (1801–39). A French dramatic author, born at Lorient. His name first became known through the drama of *Perkins Warbeo* (1828). In 1829 he published an article, "Le mouton enragé," in *L'Album*, against Charles X and his family, which caused him to be sentenced to five years' imprisonment. The revolution of 1830 liberated him, and he continued writing constantly for the stage and generally with political intent. Among his plays are *Jeanne la folle* (1831) and *Le procès d'un maréchal de France* (1831).

FONTANA, fôn-tä′nȧ, CARLO (1634–1714). An Italian architect and archæologist, born at Bruciato, near Como. He studied in Rome under Bernini and became one of his best pupils, but his work is heavy and ugly. He built the palaces of Grimazzi and Bolognetti, the tomb of Queen Christina in St. Peter's, the great fountains of St. Peter's, the façade of Santa Maria in Trastevere, and the church of San Michele a Ripa. The Villa Lichtenstein at Vienna was built from his designs in 1697. He wrote several books of great interest, such as *Il tempio vaticano e sua origine con gli edifici più cospicui antichi e moderni* (1694); *Utilissimo trattato delle acque correnti* (1696); *L'Anfiteatro Flavio* (1725).

FONTANA, fôn-tä′nä, DOMENICO (1543–1607). An Italian engineer and architect, born in 1543 at Mili in the vicinity of Lake Como. At an early age he went to Rome, where, as a protégé of Cardinal Montalto, he built the Villa Negroni (c.1580), the Sistine Chapel in Santa Maria Maggiore, and an adjoining palace. For his disinterested devotion in continuing these works at his own cost when his patron's fortunes failed, the Cardinal, when he later became Pope Sixtus V, rewarded him (1585) with important commissions, among which stands conspicuously the completion of the dome and lantern of St. Peter's, substantially upon Michelangelo's design, slightly modified by Della Porta. He increased his fame by the removal and reërection of the Egyptian obelisk in the Piazza of St. Peter's. He afterward erected the obelisks in the Piazza del Popolo and the Lateran and was intrusted by Sixtus with the construction of the Lateran Palace, of a new façade for the transept of the basilica of St. John Lateran, and of the famous Vatican library. In the construction of the aqueduct known as the Acqua Felice, with the fountain of the Acqua Paola, he was assisted by his brother Giovanni. On the death of Sixtus, Fontana was stripped of his post as papal architect in 1592, but found employment under the King of Naples, for whom he erected the Palazzo Reale and a noble promenade along the bay. His conception of a grander harbor was carried into effect by others, his death in 1607 at Naples depriving the undertaking of his personal superintendence.

Fontana's son, GIULIO CESARE, heir to his father's great wealth and some of his genius, was appointed royal architect on his decease. Consult: Milizia, *Le vite dei più celebri architetti* (Rome, 1768), trans. by Cresy; *The Lives of Celebrated Architects, Ancient and Modern* (London, 1826). Modern authorities, with full illustrations, are Ebe, *Spät-Renaissance* (Berlin, 1886) and Strack, *Baudenkmäler Roms des 15–19 Jahrhunderts* (ib., 1891).

FONTANA, Felice (1730–1805). A celebrated Italian physiologist. At the termination of an elaborate course of study carried on in the universities of Verona, Parma, Padua, and Bologna, he was appointed to the chair of philosophy in the University of Pisa by Francis I, Grand Duke of Tuscany. Leopold, on succeeding his father, appointed Fontana court physiologist and charged him with the organization of a museum of natural history and physiology, which comprises a superb collection of specimens of the animal, vegetable, and mineral kingdoms, besides an elaborate series of wax models, representing the human body as a whole, and each organ separately. A similar collection was prepared by Fontana for the Museum of Vienna by order of the Emperor Joseph II. His writings include: *Ricerche filosofiche sopra la fisica animale* (1781); *Dei moti dell' iride* (1765); *Traité sur le venin de la vipère et sur les poisons américains* (1781); *Choix d'observations physiques et chirurgicales* (1785).

FONTANA, Giovanni (1540–1614). An Italian architect, born at Mili near Lake Como, the elder brother of the more famous Domenico Fontana (q.v.), whom he assisted in many of his works. He designed the Giustiniani Palace in Rome but achieved greater fame as an engineer of water works than as an architect. Among his most famous works were the fountains of the Vatican Gardens, and of the Villa Mondragone at Frascati, and he had a hand in the design of the Acqua Paola at Rome. He superintended the cleansing of the Tiber, built canals, restored the Cloaca Maxima, built the aqueducts at Loretto and Recanati, and erected the walls or parapets around the cascades at Tivoli. In 1592 he became papal architect under Clement VIII (1592–1605).

FONTANA, Lavinia (1552–1614). An Italian painter of the Bolognese school. She was the daughter and pupil of Prospero Fontana. She painted religious, historical, and mythological canvases, but was especially famous as a fashionable portrait painter. Her reputation, however, has waned. She lived at Bologna, then at Rome, where she was made a member of the Academy of St. Luke. Among her best portraits are those of Pope Gregory XIII, and that of herself, in possession of Count Zappi da Imola. Her husband, Paolo Zappi, an amateur, assisted her in her painting. She is represented in the galleries of Bologna, Florence, Milan, Rome, Dresden, Berlin, Madrid, and in the Hermitage, St. Petersburg.

FONTANA, Prospero (1512–97). An Italian painter of the Bolognese school. He belonged to the Mannerist group, having studied in Bologna under Innocenzio da Imola; he was, however, more influenced by the works of Vasari. Upon the recommendation of Michelangelo he was employed by Pope Julius III at Rome, and afterward assisted Primaticcio in decorating the Palace of Fontainebleau. The rest of his life was passed at Bologna, where he died in 1597. He exercised much influence upon the art of Bologna—of a detrimental nature, according to Lanzi—and numbered among his pupils the Carracci (q.v.), who deserted his methods, Calvaert, and others. He was a painter of great facility, but of incorrect and negligent methods. His best works are at Bologna, and his portraits are better than his historical compositions. He is also represented in the Dresden Gallery, the Brera (Milan), and the Borghese Gallery (Rome).

FONTANE, fôɴ'tän', Marius (1838–). A French author, born at Marseilles. He became secretary to Ferdinand de Lesseps, who made him general secretary of the Suez Canal Company, and later a member of the board of directors of the Panama Canal Company. Upon revelations connected with the latter enterprise he was condemned to two years' imprisonment, but later was acquitted (1893). His publications enter many fields and include: *Confidences de la vingtième année* (1863); *Sélim l'égorgeur* (1865); *La guerre d'Amérique* (2 vols., 1866); *L'Histoire universelle* (vol. i, 1881; vol. x, 1899; unfinished).

FONTANE, fôn-tä'ne, Theodor (1819–98). A noteworthy German author, of French descent, born at Neuruppin (Brandenburg). After study at the Industrial School of Berlin and three years (1840–43) spent as an apothecary's apprentice at Leipzig and Dresden, he turned to the more congenial activities of journalism and literature. He was an editor on the staff of the *Neue Preussische Zeitung* from 1860 to 1870 and from 1870 to 1889 wrote authoritatively as dramatic critic for the *Vossische Zeitung.* In 1870 he visited the scene of war in France and was taken prisoner at Domrémy. He was a close student of the thought and literature of England, where he resided in 1844, 1852, and 1855–59, chiefly for the purpose of investigating the old ballads which had so important an effect upon his own earlier work as a poet. In 1876 he was elected first secretary of the Berlin Academy of Arts and in 1891 received 3000 marks from the German Emperor in recognition of his services to German literature. He published two collections of verse: *Gedichte* (1851; 8th ed., 1902) and *Balladen* (1861), of whose contents such poems as "Archibald Douglas," done in the very spirit of their English prototypes, placed him among the foremost modern ballad writers. Volumes based on his observations in Great Britain—*Aus England* (1860); *Jenseit des Tweed* (1860)—or on the Franco-Prussian War—*Kriegsgefangen* (1871, 6th ed., 1904); *Der Krieg gegen Frankreich* (1873–75)—were much esteemed in Germany, and his *Wanderungen durch die Mark Brandenburg* (1861–82; numerous subsequent editions) established him as the peculiar interpreter of that region. It was from Brandenburg also that he drew the material for many of the novels that made him famous. These began in 1878 with *Vor dem Sturm* and closed with his masterpieces, *Effi Briest* (1895) and *Der Stechlin* (1899). His *Irrungen, Wirrungen* (1888; 8th ed., 1902) is credited with the introduction of what has become known as the Berlin type of fiction. It certainly allied him with the younger school, the so-called realists. But his realism was quite individual and dominated by his own kindly personality. After the death of Freytag (1895) he occupied a position of prominence in European literature. No notice of him would be complete without mention of his reminiscences, *Meine Kinderjahre* (1894), and *Von Zwanzig bis Dreissig* (1898).

Consult Servaes, *Theodor Fontane* (Berlin, 1900), and Erich Schmidt, in *Charakteristiken*, vol. ii (ib., 1901).

FON'TANEL' (Fr. *fontanelle*, dim. for *fontaine*, fountain, from ML. *fontana*, fountain, from Lat. *fons*, fount). One of the soft pulsating spots on the head of a very young infant. Of these there are three or four, the principal one being at the crossing of the sagittal and coronal sutures. This is the great or anterior fontanel. The next in importance is the posterior fontanel, at the junction of the sagittal and lambdoidal sutures. The others, called the sphenoidal and the mastoidal or Gasserian fontanels, close very soon after birth, while the posterior closes a few months, and the anterior about two years, after birth. Synchronously with the pulse beat the brain pulsates through the fontanels and may be fancied to resemble the water of a fountain. The term was also applied to an artificial ulcer, formerly caused by physicians for its derivative effect. Any hard mass kept under the skin for a time will produce the necessary irritation, such as a dried pea bandaged into a cut in the skin. This causes a discharge of pus, formerly supposed to drain away the material of disease from another part of the body. The method and idea are obsolete.

FONTANES, fôɴ'tän', Louis, Marquis de (1757–1821). A French poet and political orator. He was born at Niort, March 6, 1757, and was of an ancient Protestant family of Languedoc. At 21 he attracted attention as poet by *Le cri de mon cœur* (1778) and *La forêt de Navarre* (1778). A little later he published a scholarly translation of Pope's *Essay on Man* (1783). During the early years of the Revolution he was active as a moderate Republican journalist and before the fall of Robespierre was in hiding for a time. Later he was constrained to take refuge in Hamburg, whence he went to London and became a close friend of Chateaubriand. While in England he published a much-admired imitation of Gray's "Elegy," *Le jour des morts* (1796). He returned to France in 1799, was reinstated in the Institute, of which he had been made a member in 1795, and, warmly espousing the cause of Napoleon, was made member of the legislative body (1802–10), of which he became president in 1804. Here he developed great oratorical talent in praise of the First Consul and Emperor. As Grand Master of the *Université* (1808–15), he was Napoleon's dispenser of literary favors and often his literary spokesman, as when he composed the *Eloge* on Washington. He was advanced to the Senate (1810), but he adapted himself readily to the Restoration after Leipzig, drew up Napoleon's act of abdication (1814), and was made peer by Louis XVIII. He died in Paris, March 17, 1821. Fontanes's works, edited by Sainte-Beuve in two volumes (1839), are models of elegant and correct diction and show sound literary judgment. Consult A. Tornézy, *Fontanes; étude biographique* (Poitiers, 1901), and G. Vauthier, "Fontanes et les débuts de l'Université" (*Nouvelle Revue*, Paris, 1908).

FONTANGES, fôɴ'tänzh', Marie Angélique de Scoraille de Roussille, Duchesse de (1661–81). A mistress of Louis XIV, born at the Château of Cropières in Auvergne, the daughter of the Marquis de Roussille. Maid of honor to Madame the Duchess of Orléans, she attracted the attention of the King, who made her Duchesse de Fontanges, discarding in 1679 the Marquise de Montespan, who had put her forward to offset the influence of Maintenon. She bore the King a son, who died in infancy. She died shortly afterward at the abbey of Port Royal—probably a natural death, though poison was suspected. An extremely high coiffure was called Fontange after her.

FON'TARA'BIA. See Fuenterrabia.

FONT-DE-GAUME CAVERN, fôɴ'de-gōm'. See Paleolithic Period.

FONTE, Bartolome. See Fuentes.

FONTENAY-LE-COMTE, fôɴt'nā'le-kôɴt'. The capital of an arrondissement in the Department of Vendée, France, situated on both banks of the Vendée, 27 miles northeast of La Rochelle (Map: France, N., E 6). It is an old-fashioned town, with the two fine Gothic churches of Notre Dame and Saint-Jean, and in the public square a fountain in the Gothic style, from which the town derives its name; there are also a college and a handsome theatre. There are linen and cloth and saw mills, and three important annual fairs are held. Pop., 1901, 10,512; 1911, 10,379. The town suffered considerably during the religious wars and was captured by the Vendéans in 1793, after two severe battles.

FONTENAY-MAREUIL, fôɴt'nā-mā'rẽ'y', François du Val, Marquis de (c.1594–1665). A French soldier and diplomat. He was brought up at the court of Louis XIII; served with Mayenne in Spain; with Nevers at Ratisbon; under Boisdauphin at the siege of Soissons (1617); in 1619 in Normandy; at Saint-Jean d'Angély, Clérac, and Montauban (1621); at Saint-Antoine and Montpellier (1622); at the Ile de Ré (1627); and at the sieges of La Rochelle (1628), of Privas, and of Alais (1629). He was Ambassador to England in 1630–33 and, after taking part in various campaigns against the Imperialists and Spaniards, at Rome (where Mazarin instructed him to foment a rebellion in Naples) from 1640 to 1650. His memoirs were published at Paris in 1826.

FONTENELLE, fôɴt'nĕl', Bertrand le Bovier de (1657–1757). A French scientist, Cartesian philosopher, poet, and dramatist. He was born at Rouen, Feb. 11, 1657, and was a nephew of Corneille. He was trained by the Jesuits, studied law, but abandoned it for literature and science, in which he soon earned distinction. He was secretary of the Academy of Sciences from 1699 to 1741 and edited with admirable care its *Mémoires* and *Eloges* on deceased members; in these he gave the most lucid summaries of the philosophical and scientific labors of his day. His dramatic and poetic work is negligible, but his literary studies on the French stage before Corneille and the origin of fables are still of interest. His *Histoire des oracles* (1687), *Entretiens sur la pluralité des mondes* (1686), and the *Dialogues des morts* (1683), with their clean-cut arguments and most attractive style, prepared the ground for the scientific and rationalistic spirit, by popularizing the most abstruse subjects, such as astrology and even the history and philosophical explanation of human superstitions. Thus, lacking a month of being a centenarian, he was the most important connecting link between the great stylists of the seventeenth century and the philosophers of the eighteenth century. As a frequenter of the famous salons of Madame de Lambert, Madame de Tencin, and Madame Geoffrin, he was the literary arbitrator of his contemporaries. The best edition of his works is in three volumes (Paris, 1818). Consult: Faguet, *Dix-huitième siècle* (Paris, 1894); the brief but acute criticism in Lanson, *Histoire de la littérature française* (12th ed., ib., 1912); Maigron, *Fontenelle* (ib., 1906); Thorold, *Six Masters in Disillusion* (New York, 1909).

FONTENOY, fôɴt′nwä′ (older form, *Fontenet*, from Lat. *fontanus*, pertaining to springs, from *fons*, fountain). A village of Belgium, in the Province of Hainaut, 5 miles southeast of Tournai (Map: Belgium, B 4). Here, on May 11, 1745, the French, about 50,000 strong, under Marshal Saxe, defeated nearly an equal number of English, Hanoverians, and Dutch under the Duke of Cumberland. The fight was obstinate to the last and was decided only by a smashing charge of the Household Troops and the famous Irish Brigade. The Allies lost 8000 men, the French 7000. Coming at the same time as the threatened Stuart invasion, the defeat was a great blow to England. Consult H. Pichat, *La campagne du maréchal de Saxe, de Fontenoy à Bruxelles* (Paris, 1909).

FONTENOY. A village near Auxerre, Department of Yonne, in Lower Burgundy. It is memorable for the battle fought there, June 25, 841, between the three sons of Louis the Pious, which decided the fate of the Carolingian Empire. The Emperor Lothair, who was defeated, was obliged in 843 to divide the Empire with his two brothers by the Treaty of Verdun (q.v.). Pop., 1901, 716; 1911, 633.

FONTEVRAULT, fôɴ′te-vrō′ (Fons Ebraldi—the well of Saint-Evrault). A town in the Department of Maine-et-Loire, France, on the Vienne, 8 miles southeast of Saumur. Pop., 1901, 2352; 1911, 2248. It is celebrated for the remains of the famous abbey founded in 1099 by Robert d'Arbrissel, a Breton monk. It consisted of five churches, a monastery, a nunnery, a magdaleneum, and a hospital. One church remains, a splendid example of twelfth-century architecture, of which only a part is now devoted to divine service. It contained the tombs of several members of the royal Plantagenet family of England and still possesses the effigies of Henry II and his Queen Eleanor of Aquitaine, of Richard Cœur de Lion, and of Isabella of Angoulême, wife of King John. The Tour d'Evrault, the sixteenth-century chapter house, the refectory, and the cloisters are of great archæological interest. In 1804 the buildings were inclosed by walls and converted into a huge penitentiary and industrial prison for 11 neighboring departments, with accommodation for 2000 prisoners. Napoleon III, in 1867, occasioned a national outburst of indignation by offering the Plantagenet statues to Queen Victoria, a vandal act that was frustrated by the refusal of the prison director to deliver them to the English agent. Consult Edouard, *Fontevrault et ses monuments* (2 vols., Paris, 1875), and Bossebœuf, *Fontevrault, son histoire et ses monuments* (Tours, 1890).

FONTEVRAULT, Order of. A monastic order following the Benedictine rule, founded by Robert d'Arbrissel. He was born in 1047 and took his doctor's degree in Paris. As vicar-general of the diocese of Rennes, he devoted himself zealously to the extirpation of clerical concubinage and simony. Later he took up the life of a hermit in the forest of Craon, between Anjou and Brittany. The fame of his sanctity attracted disciples, whom in 1094 he formed into a community under the rule of St. Augustine at La Roe. He received special permission from Pope Urban II to preach the Crusade; but in 1099 he founded a community at Fontevrault (q.v.) for persons of both sexes who preferred a life of penance at home. As several houses developed, of which those for women were especially dedicated to the Blessed Virgin, Robert placed those for men also under the jurisdiction of the Abbess of Fontevrault as superior of the whole order, representing the heavenly patroness. The first abbess was Petronilla of Chemillé. They were pledged to observe the Benedictine rule in its full rigor, not eating flesh even in sickness. Paschal II confirmed the order in 1106 and 1112. The founder died in 1117, after establishing numerous cloisters; more than 60 arose after his death on the same model, principally in France, though a few extended to England and Spain. The order ultimately declined, in spite of the efforts at reform of three of its abbesses, Mary of Brittany (1477), Renée of Bourbon (1507), and Antoinette of Orléans (1571–1618), and finally became extinct. In 1803 a Fontevrist nun began a school at Chemillé, the home of the first abbess, from which grew a modest revival of the order, numbering three houses in 1849. Consult Malifaud, *L'Abbaye de Fontevrault* (Angers, 1866), and *Bibliographie des Benedictins de la Congregation de France* (new ed., Paris, 1906).

FONTHILL ABBEY. See Beckford.

FONVIELLE, fôɴ′vyĕl′, Louis Eugène, Knight of (1655–1711). A French pirate, born at Thouars (in the present Department of Deux-Sèvres). He became a privateer in 1674, turned buccaneer in 1677, and in command of his own vessel cruised among the West Indies, attacking and plundering the Spaniards. He was a lieutenant in the French navy from 1679 to 1681, when he was elected chief of the buccaneers, whom he held in readiness to aid the French at Santo Domingo. When the French expedition against Cartagena was organized by Baron de Pointis in 1697, he commanded 600 buccaneers. In 1702 he helped Ducasse, Governor of Santo Domingo, to defeat a superior English fleet under Admiral John Benbow. He accompanied Duclerc's unsuccessful French expedition against Rio de Janeiro in 1710 and after his surrender was murdered by the Spaniards.

FONVIELLE, Wilfrid de (1824–1914). A French aëronaut, meteorologist, and author. He was born at Paris and in his early life was a teacher of mathematics. After 1858 he gained distinction as an aëronaut. He made numerous balloon ascents with Tissandier for meteorological purposes, and in November, 1870, during the siege of Paris, he escaped from the city in a balloon and proceeding to London gave a series of lectures on the benefits of a republican form of government. His principal scientific works are: *L'Homme fossil* (1865); *Les merveilles du monde invisible* (1866); *Eclairs et tonnerres* (1867), trans. into English under the title of *Thunder and Lightning; L'Astronomie moderne* (1868); *Histoire de la lune* (1886); *Mort de faim* (1886). An account of the balloon ascents made by Fonvielle, Glaisher, and others appeared in French in 1870, and an English translation was published in 1871 under the title of *Travels in the Air*. In addition to the above-mentioned works Fonvielle wrote several political pamphlets and *Aventures aëriennes* (1876) and *La prévision du temps* (1879).

FOOCHOW (*Fu-chau* or *Fuhchow*, Chin., Happy Region). A walled city of China, capital of the Province of Fookien, and one of the five ports opened to foreign residence and trade by the treaty negotiated by the British at Nanking in 1842. In the local dialect the name is Hokchiu.

Foochow is well situated in a beautiful and fertile plain, on the river Min, about 34 miles from its mouth. The city proper lies nearly 3 miles from the north bank and is surrounded by a wall about 30 feet high. Suburbs extend to the river and also occupy the opposite bank. Foochow is the port of the rich district included in the valley of the Min and its tributaries, one of the great tea-growing areas. The walls, which have a circuit of about 6½ miles and are pierced with seven massive gates surmounted with lofty towers, inclose three finely wooded hills—Black Rock Hill, in the southwest angle; the Hill of the Nine Genii, in the southeast; and Screen Hill, in the northeast. The eastern part of the inclosure is known as the Tatar town, a garrison having been established here by the conquering Manchus in the seventeenth century. The principal street of the city runs from north to south and is continued through the south gate by a long causeway to and through the city's most populous and most important suburb on the river bank. From this point a celebrated stone bridge—the Bridge of Ten Thousand Ages—leads across the river to a densely peopled little island, Tongchiu (Middle Island), and from this island another stone bridge, 300 feet in length, completes the line of communication with the foreign settlement on the island of Nantai. The Bridge of Ten Thousand Ages is said to have been built over eight centuries ago. It is 1350 feet long, about 14 feet in width, and is formed of a granite causeway laid upon thick stone slabs 45 feet long, which rest on about 40 immense stone piers. Strong stone parapets mortised into large stone pillars protect pedestrians. This is the limit of navigation for seagoing junks; but barges and smaller craft with movable masts may pass under the bridge. Foreign vessels, except those of very light draft, anchor lower down at Pagoda Island, which lies off the lower end of Nantai Island.

Near here, on the left bank of the river, are the arsenal and navy yard, established in 1867 and managed by Frenchmen. Many war vessels have been launched here, and most of the naval officers of China were trained in the school of navigation attached to the arsenal. In 1884, during hostilities with France, the arsenal and the fortifications in the neighborhood suffered greatly from a brief bombardment by the French. Foochow has modern wharfs for shipping, a dry dock 300 feet long, and factories for the manufacture of cotton and silk fabrics, and paper. Among the other articles produced are "soapstone" or steatite figures, vases, and other ornamental objects, artificial flowers, and figures of birds carved in charcoal and colored to represent the living originals. Foochow lacquer is also well known.

Foochow was opened to foreign commerce in 1842, but it was not until 1853 that the tea trade of the port began to assume any importance. In 1912 the net value of the trade of the port was $13,579,000, of which $6,376,000 represented native produce of local origin sent to foreign countries and $5,460,000 the imports from foreign countries. The foreign trade has suffered in a diminished export of teas and import of opium. The chief articles imported from foreign countries included cotton goods, lead, tin, tin plate, steel, kerosene oil, machinery, flour, and sugar; and the chief exports were timber, wood for kerosene-oil cases, tea, canes, matches, and various kinds of fruit.

In 1912 there were 679 vessels engaged in coastwise and foreign trade with this port, with a tonnage of 520,534.

The port is now connected by telegraph with the principal cities of China and by cable with Formosa, Hongkong, and Europe. There is fortnightly connection with Hongkong by steam.

Foochow is the residence of the Governor of Fookien province and of the Viceroy, or Governor-General, of the united provinces of Chekiang and Fookien.

The population of the city, including its seven suburbs, has been estimated at 624,000.

Bibliography. For a good description of the city, see Doolittle, *Social Life of the Chinese* (New York, 1867), and Mayers and others, *The Treaty Ports of China and Japan* (London, 1867). For statistics, consult the annual reports of the Maritime Customs of China. For the language, consult Maclay, *Manual of the Foo-chow Dialect*, and Maclay and Baldwin, *Chinese-English Dictionary* (1871).

FOOD (AS. *fōda*, Icel. *fæþi*, Goth. *fōdeins*, food; connected with Gk. *πατεῖσθαι*, *pateisthai*, to feed). The articles of animal and vegetable origin that form the diet of man. Sometimes this term includes also spices, vinegar, and similar articles which, strictly speaking, are not foods, but are more properly called food accessories or condiments.

The food of any individual or family is to a very large extent determined by circumstances. Anthropologists claim, and with good reason, that in the earliest days of the human race man lived without much choice on the food which he could obtain, being fitted by his inheritance from earlier forms of life to use a large variety of food stuffs.

In considering the human race as a whole there are three great epochs in man's diet, viz.: (1) the early hunting period, in which man depended entirely on a natural supply of both animal and vegetable food; (2) the cooking period, in which man still used a natural supply of food but prepared it for use with the aid of heat; and (3) the so-called cibicultural, or food-producing, period—i.e., the period in which man has depended upon the cultivation of both flocks and herds and field and garden crops to supplement a wild supply of food.

Civilized man still obtains his fish supply largely from the rivers and other waters, but with this exception he has come to depend almost wholly on a food supply which is produced through his own efforts directed in the various lines of agriculture.

In general, the food habits of the human race are an expression of the thousands of years of experience in which man has sought to bring himself into harmony with his environment, and food habits have been determined, as regards materials selected, by available supply, man being by nature omnivorous.

A study of food and the feeding of the body, i.e., nutrition, should include knowledge of the requirements and the chemical composition of the body, the chemical composition, the laws of energy and of the metabolism of matter. Account must be taken of methods of preparing and cooking foods, of the hygiene, the comparative pecuniary value, the quantities of foods eaten, etc. Some of these subjects require investigations by specially devised methods; others are carried on by the help of physiological chemistry, bacteriology, and other related sciences. From the standpoint of nutrition, food may be defined as substance that builds, repairs, and maintains tissue or yields energy, or does both, when taken into the body. The most healthful food is that which is best fitted to the needs of the user; the cheapest food is that which furnishes the largest amount of proper nutriment at the least cost. In general, the best food is that which is both the cheapest and the most healthful.

The substances that nourish the body are very similar in chemical composition to those that compose it. They are made up of from 15 to 20 chemical elements, the most abundant of which are oxygen, hydrogen, carbon, nitrogen, calcium, phosphorus, and sulphur. The elements are combined in a great variety of ways in the compounds of both the food and the body. Five general classes of these substances are made as follows: water, mineral matter, the protein group, or total nitrogenous matter, fats, and carbohydrates, the first two of which are called inorganic, the other three organic. In addition to material supplied in food, the body requires the oxygen of the air for the oxidation of nutrients and the production of energy.

Inorganic Constituents. Water is the most abundant of the substances mentioned. It is a component part of all the tissues and forms over 60 per cent by weight of the body of the average man. Though very important physiologically, it neither builds tissue nor yields energy. Other food ingredients which yield little or no energy, and yet are indispensable to the body, are the mineral matters, i.e., those substances that remain as ash when body or food tissue is burned. They consist mainly of phosphate of lime or calcium phosphate, the mineral basis of bone, and numerous compounds of potassium, sodium, magnesium, and iron. They form only 5 or 6 per cent, by weight, of the body, and are found chiefly in the bones and the teeth, but are present in the other tissues and also in solution in the various fluids.

Organic Constituents. The organic compounds are so called because they occur principally in the organic, i.e., the animal and vegetable world. They all contain carbon, oxygen, and hydrogen, in varying proportions. Some also contain nitrogen, phosphorus, sulphur, or other elements. *Protein Group.*—The protein group includes all compounds that contain nitrogen; e.g., the lean and gristle of meat, the white of eggs, and the gluten of wheat. In proximate analyses protein is estimated by multiplying the total nitrogen by 6.25 or some similar factor. Protein forms about 18 per cent, by weight, of the body of the average man. Among the protein constituents of foods, the true proteins (or proteids) are complex—usually amorphous compounds of different composition and properties, but all having high molecular weight. They are regarded as being essentially anhydrides of amino acids. Protein is the organic basis of bone, muscle, and other tissues, and is essential to the body structure. Proteins are also used as fuel—that is, are burned in the body to yield energy—and are to some extent transformed into fat and stored in the body, but these are the less important uses. The protein compounds are most abundant in some of the animal foods, as lean meat, though the cereals contain them in considerable, and dried peas and beans in large, proportions. The protein group contains other nitrogenous compounds besides the true proteins, including the so-called "nitrogenous extractives," alkaloids, nitrogenous fats, and essential oils, and some inorganic compounds as ammonium salts. With the exception of some of the extractives, however, the amount of the nonprotein compounds in body tissue or in foods is small, and true proteins and their immediate derivatives make up nearly all of the nitrogenous material, or "protein group," in nutrition. *Fats.*—Fats occur chiefly in animal foods, as meats, fish, butter, etc., but in considerable quantities in some cereals, notably oatmeal and maize (whole kernel), and in various nuts. They are also abundant in some vegetable products, such as olives and cottonseed, from which they are expressed as oil. In our bodies and in those of animals fats occur in minute particles scattered through the various tissues and in masses under the skin and in other localities. The amount of fat in the body varies greatly with food, exercise, age, and other conditions. When more food is taken than is necessary for immediate use, part of the surplus may be stored in the body. The protein and fat of food may thus become body protein and body fat; sugar and starch of food are changed to fat in the body and stored as such. When the food supply is short, this reserve material is drawn upon for supplementary fuel. Fats form about 15 per cent, by weight, of the body of an average man. Fats in food analyses are often termed "ether extract" and include some substances (as wax) which are not true fat. *Carbohydrates.*—The carbohydrates, which include such compounds as starches, different kinds of sugar, and the cellulose or fibre of plants, are found chiefly in the vegetable foods, like cereal grains and potatoes, and form only a very small proportion of the body tissues—less than 1 per cent. Milk, however, contains considerable amounts of milk sugar, which is a carbohydrate. Starches and sugars, which are very abundant in ordinary vegetable food materials, are important food substances, because they are easily digested and because they form an abundant source of energy. They may be and often are transformed into fat in the body. In food analysis "total carbohydrates" are usually determined by difference, and the group then may include organic acids, e.g., as well as true carbohydrates.

To a greater or less extent the different nutrients can do one another's work. If the body has not enough of one kind of fuel, it can use another. But while protein may be burned in the body in the place of fats and carbohydrates, neither of the latter can take the place of the proteins in building and repairing the tissues. By being consumed themselves, however, they protect the proteins from consumption, but they cannot replace protein as tissue builder.

Recent investigations have led to the conclusion that certain substances are present in foods in very small quantities which, minute as they are, are essential for nutrition. "Vitamin" is a name given to such substances. Vitamins are found in green plants, in the bran layer of cereal grains, in beans, milk, and other foods, both animal and vegetable.

Refuse. Food as it is bought at the market or even as it is served on the table, contains more or less of materials—such as the bones of meat and fish, the shells of eggs, and the skins and seeds of fruits and vegetables—which we cannot or do not eat and which would have little or no nutritive value if we did eat them. In discussing the chemical composition of foods such portions are usually counted as refuse, but they make an important item when we consider the actual cost of the nutrients of food. The materials grouped together as refuse contain, in part, the same ingredients as the edible portion, though usually in very different proportions. Thus, bones are largely mineral matter, with some fat and protein; egg shells are almost entirely mineral matter; bran of wheat has a high content of fibre or woody material.

The Body as a Machine. Blood and muscle, bone and tendon, brain and nerve—all the organs and tissues of the body—are built from the nutritive ingredients of food. With every motion of the body, with the exercise of feeling and of thought, material is consumed and must be resupplied by food. In a sense the body is a superior machine, and, like other machines, it requires material to build up its several parts, to repair them as they are worn out, and to serve as fuel. In some ways it uses this material like a machine; in others it does not. The steam engine gets its power from fuel; the body does the same. In the one case coal or wood, in the other food, is the fuel. In both cases the energy—the potential energy—which is latent in the fuel is transformed into heat and power; and so the body is a prime mover. As an engine, it has an efficiency of 25 per cent for external muscular work. When coal is burned in a furnace, part of its potential energy is transformed into the mechanical power which the engine uses for its work; the rest is wasted in the heat that the engine does not utilize. Likewise the potential energy of the food is transformed in the body into mechanical power and heat. The mechanical power is employed for the internal work of the body (circulation of the blood, etc.) and for external muscular work. The heat which results from the utilization of food in the body is used to keep the body warm, and when more is generated than is needed for that purpose it is wasted, as in the case of the engine. However, the body is much more economical in the use of fuel than any engine. One important difference between the human machine and the steam engine is that the former is self-building, self-repairing, and self-regulating. Another is that the material of which the engine is built is very different from that which it uses for fuel, but part of the material which serves the body as a source of energy also builds it up and keeps it in repair. Furthermore, the body can use its own substance for fuel; the steam engine cannot.

The energy value of food may be readily determined by burning samples in a bomb calorimeter, in an atmosphere of oxygen to secure ready and complete combustion. The heat given off passes through the walls of the bomb and is taken up by a known volume of water of known temperature. From the increase in the temperature of the water the amount of heat liberated is calculated. The unit commonly used to express the energy value of food, as well as often energy in general, is the calorie, i.e., the amount of heat which would raise the temperature of one kilogram of water 1° C., or, what is nearly the same thing, one pound of water 4° F. Instead of this, a unit of mechanical energy—the foot ton, e.g., may be used. This represents the force required to raise a weight of one ton to the height of one foot. One calorie is equal to very nearly 1.54 foot tons; i.e., one calorie of heat, when transformed into mechanical power, would suffice to lift one ton 1.54 feet. Taking our common food materials as they are used in ordinary diet, the following general estimate has been made for the energy furnished to the body by one gram or one pound of each of the classes of nutrients:

Protein, fuel value, 4 calories per gram, or 1820 calories per pound.

Fats, fuel value, 9 calories per gram, or 4080 calories per pound.

Carbohydrates, fuel value, 4 calories per gram, or 1820 calories per pound.

When we compare the nutrients in respect to their fuel value—i.e., their capacities for yielding heat and mechanical power—it will be seen that a pound of protein of lean meat or albumen of egg is just about equivalent to a pound of sugar or starch, and a little over two pounds of either would be required to equal a pound of the fat of meat or butter or of body fat.

The following table shows the average composition as purchased of a number of the more common materials. For the composition of others, see BUTTER; EGGS; FRUIT; MEAT; MILK; CHEESE; NUTS; VEGETABLES; WHEAT; MAIZE; BUCKWHEAT; FIG; ETC.

Digestibility. Not only is composition considered in valuing a food, but digestibility also. Digestibility is a term used to indicate the thoroughness of digestion, i.e., the amount of a given food which the body retains for its uses when the food passes through the digestive tract. The term is also used, though much less exactly, with reference to the agreement or disagreement with an individual of some given food or with reference to the supposed ease or difficulty with which a food parts with its nutrients to the body. The changes which food undergoes in digestion are brought about by ferments which are secreted by the digestive organs. (See ALIMENTARY SYSTEM; DIGESTION, ORGANS OF.) The ptyalin of saliva in the mouth changes some insoluble starches into sugar. The food does not remain in the mouth for a long time, but nevertheless the action of the saliva is considerable. Saliva also helps to prepare the food for the stomach by moistening it and making its texture such that the digestive juice of the stomach may readily act upon it. The gastric juice acts upon protein; the pancreatic juice of the intestine (see PANCREAS) upon protein, fat, and carbohydrates. All the digestive juices are assisted by a fine division of the food in chewing and by muscular contractions, called the peristaltic action of the stomach and intestine. These latter motions help to mix the digestive juices and their ferments with the food. The nutrients of food are broken up into simpler compounds by digestion. The cleavage products of the nutrients find their way through the walls of the alimentary canal into the circulation, and in this passage and later undergo remarkable changes. When finally the blood, supplied with nutrients of the digested food and laden with the oxygen from the lungs, is propelled from the heart all over the body, it is ready to furnish the organs and tissues with the materials and energy needed for the various

TABLE I.—AVERAGE COMPOSITION OF SOME COMMON ANIMAL FOOD PRODUCTS

FOOD MATERIALS (AS PURCHASED)	Refuse	Water	Protein	Fat	Carbohydrates	Ash	Fuel value per pound
ANIMAL FOOD	%	%	%	%	%	%	*Calories*
Beef, fresh:							
Chuck ribs	16.3	52.6	15.5	15.0	....	0.8	910
Porterhouse steak	12.7	52.4	19.1	17.9	....	.8	1,100
Sirloin steak	12.8	54.0	16.5	16.1	....	.9	975
Round	7.2	60.7	19.0	12.8	....	1.0	890
Rump	20.7	45.0	13.8	20.2	....	.7	1,090
Shank, fore	36.9	42.9	12.8	7.3	....	.6	545
Beef, corned, canned, pickled, and dried:							
Corned beef	8.4	49.2	14.3	23.8	....	4.6	1,245
Dried, salted, and smoked	4.7	53.7	26.4	6.9	....	8.9	790
Canned corned beef	....	51.8	26.3	18.7	....	4.0	1,270
Veal:							
Breast	21.3	52.0	15.4	11.0	....	.8	745
Leg	14.2	60.1	15.5	7.9	....	.9	625
Leg cutlets	3.4	68.3	20.1	7.5	....	1.0	695
Mutton:							
Flank	9.9	39.0	13.8	36.9	....	.6	1,770
Leg, hind	18.4	51.2	15.1	14.7	....	.8	890
Loin chops	16.0	42.0	13.5	28.3	....	.7	1,415
Lamb:							
Breast	19.1	45.5	15.4	19.1	....	.8	1,075
Leg, hind	17.4	52.9	15.9	13.6	....	.9	860
Pork, fresh:..							
Ham	10.7	48.0	13.5	25.9	....	.8	1,320
Loin chops	19.7	41.8	13.4	24.2	....	.8	1,245
Shoulder	12.4	44.9	12.0	29.8	....	.7	1,450
Tenderloin	....	66.5	18.9	13.0	....	1.0	895
Pork, salted, cured, and pickled:							
Ham, smoked	13.6	34.8	14.2	33.4	....	4.2	1,635
Shoulder, smoked	18.2	36.8	13.0	26.6	....	5.5	1,335
Salt pork	....	7.9	1.9	86.2	....	3.9	3,555
Bacon, smoked	7.7	17.4	9.1	62.2	....	4.1	2,715
Soups:							
Celery, cream of	....	88.6	2.1	2.8	5.0	1.5	235
Beef	....	92.9	4.4	.4	1.1	1.2	120
Meat stew	....	84.5	4.6	4.3	5.5	1.1	365
Tomato	....	90.0	1.8	1.1	5.6	1.5	185
Poultry:							
Chicken, broilers	41.6	43.7	12.8	1.4	....	.7	305
Fowls	25.9	47.1	13.7	12.3	....	.7	765
Goose	17.6	38.5	13.4	29.8	....	.7	1,475
Turkey	22.7	42.4	16.1	18.4	....	.8	1,060
Fish:							
Cod, dressed	29.9	58.5	11.1	.2	....	.8	220
Halibut, steaks or sections	17.7	61.9	15.3	4.4	....	.9	475
Mackerel, whole	44.7	40.4	10.2	4.2	....	.7	370
Perch, yellow dressed	35.1	50.7	12.8	.7	....	.9	275
Shad, whole	50.1	35.2	9.4	4.8	....	.7	380
Shad, roe	....	71.2	20.9	3.8	2.6	1.5	600
Fish, preserved:							
Cod, salt	24.9	40.2	16.0	.4	....	18.5	325
Herring, smoked	44.4	19.2	20.5	8.8	....	7.4	755
Fish, canned:							
Salmon	....	63.5	21.8	12.1	....	2.6	915
Sardines	*5.0	53.6	23.7	12.1	....	5.3	950
Shellfish:							
Oysters, "solids"	....	88.3	6.0	1.3	3.3	1.1	225
Clams	....	80.8	10.6	1.1	5.2	2.3	340
Crabs	52.4	36.7	7.9	.9	.6	1.5	200
Lobsters	61.7	30.7	5.9	.7	.2	.8	145
Eggs; Hens' eggs	†11.2	65.5	13.1	9.3	....	.9	635
Dairy products, etc:							
Butter	....	11.0	1.0	85.0	....	3.0	3,410
Whole milk	....	87.0	3.3	4.0	5.0	.7	310
Skim milk	....	90.5	3.4	.3	5.1	.7	165
Buttermilk	....	91.0	3.0	.5	4.8	.7	160
Condensed milk	....	26.9	8.8	8.3	54.1	1.9	1,430
Cream	....	74.0	2.5	18.5	4.5	.5	865
Cheese, Cheddar	....	27.4	27.7	36.8	4.1	4.0	2,075
Cheese, full cream	....	34.2	25.9	33.7	2.4	3.8	1,885
VEGETABLE FOOD							
Flour, meal, etc:							
Entire-wheat flour	....	11.4	13.8	1.9	71.9	1.0	1,650
Graham flour	....	11.3	13.3	2.2	71.4	1.8	1,645
Wheat flour, patent roller process:							
High-grade and medium	....	12.0	11.4	1.0	75.1	.5	1,635
Low-grade	....	12.0	14.0	1.9	71.2	.9	1,640
Macaroni, vermicelli, etc.	....	10.3	13.4	.9	74.1	1.3	1,645
Wheat breakfast food	....	9.6	12.1	1.8	75.2	1.3	1'680
Buckwheat flour	....	13.6	6.4	1.2	77.9	.9	1,605
Rye flour	....	12.9	6.8	0.9	78.7	.7	1,620
Corn meal	....	12.5	9.2	1.9	75.4	1.0	1,635
Oat breakfast food	....	7.7	16.7	7.3	66.2	2.1	1,800
Rice	....	12.3	8.0	.3	79.0	.4	1,620
Tapioca	....	11.4	.4	.1	88.0	.1	1,650
Starch	....	....	....	....	90.0	....	1,675

* Refuse, including oil.

† Refuse, shell.

FOOD MATERIALS (AS PURCHASED)	Refuse	Water	Protein	Fat	Carbo-hydrates	Ash	Fuel value per pound
VEGETABLE FOOD—CONTINUED							
Bread, pastry, etc.:	%	%	%	%	%	%	*Calories*
White bread	....	35.3	9.2	1.3	53.1	1.1	1,200
Brown bread	....	43.6	5.4	1.8	47.1	2.1	1,040
Graham bread	....	35.7	8.9	1.8	52.1	1.5	1,195
Whole-wheat bread	....	38.4	9.7	.9	49.7	1.3	1,130
Rye bread	....	35.7	9.0	.6	53.2	1.5	1,170
Sugars, etc.:							
Molasses	....	....	....	....	70.0	....	1,225
Candy*	....	....	....	....	96.0	....	1,680
Honey	....	....	....	....	81.0	....	1,420
Sugar, granulated	....	....	....	....	100.0	....	1,750
Maple sirup	....	....	....	....	71.4	....	1,250
Vegetables:†							
Beans, dried	....	12.6	22.5	1.8	59.6	3.5	1,520
Beans, Lima, shelled	....	68.5	7.1	.7	22.0	1.7	540
Beans, string	7.0	83.0	2.1	.3	6.9	.7	170
Beets	20.0	70.0	1.3	.1	7.7	.9	160
Cabbage	15.0	77.7	1.4	.2	4.8	.9	115
Celery	20.0	75.6	.9	.1	2.6	.8	65
Corn, green (sweet), edible portion	....	75.4	3.1	1.1	19.7	.7	440
Cucumbers	15.0	81.1	.7	.2	2.6	.4	65
Lettuce	15.0	80.5	1.0	.2	2.5	.8	65
Onions	10.0	78.9	1.4	.3	8.9	.5	190
Parsnips	20.0	66.4	1.3	.4	10.8	1.1	230
Peas (*Pisum sativum*) dried	....	9.5	24.6	1.0	62.0	2.9	1,565
Peas (*Pisum sativum*), shelled	....	74.6	7.0	.5	16.9	1.0	440
Cowpeas, dried	....	13.0	21.4	1.4	60.8	3.4	1,505
Potatoes	20.0	62.6	1.8	.1	14.7	.8	295
Rhubarb	40.0	56.6	.4	.4	2.2	.4	60
Sweet potatoes	20.0	55.2	1.4	.6	21.9	.9	440
Spinach	....	92.3	2.1	.3	3.2	2.1	95
Squash	50.0	44.2	.7	.2	4.5	.4	100
Tomatoes	....	94.3	.9	.4	3.9	.5	100
Turnips	30.0	62.7	.9	.1	5.7	.6	120
Vegetables, canned:							
Baked beans	....	68.9	6.9	2.5	19.6	2.1	555
Peas (*Pisum sativum*) green	....	85.3	3.6	.2	9.8	1.1	235
Corn, green	....	76.1	2.8	1.2	19.0	.9	430
Succotash	....	75.9	3.6	1.0	18.6	.9	425
Tomatoes	....	94.0	1.2	.2	4.0	.6	95
Fruits, berries, etc., fresh ††							
Apples	25.0	63.3	.3	.3	10.8	.3	190
Bananas	35.0	48.9	.8	.4	14.3	.6	260
Grapes	25.0	58.0	1.0	1.2	14.4	.4	295
Oranges	27.0	63.4	.6	.1	8.5	.4	150
Pears	10.0	76.0	.5	.4	12.7	.4	230
Raspberries	....	85.8	1.0	....	12.6	.6	220
Strawberries	5.0	85.9	.9	.6	7.0	.6	150
Fruits, dried:							
Apples	....	28.1	1.6	2.2	66.1	2.0	1,185
Apricots	....	29.4	4.7	1.0	62.5	2.4	1,125
Dates	10.0	13.8	1.9	2.5	70.6	1.2	1,275
Figs	....	18.8	4.3	.3	74.2	2.4	1,280
Raisins	10.0	13.1	2.3	3.0	68.5	3.1	1,265
Nuts:							
Almonds	45.0	2.7	11.5	30.2	9.5	1.1	1,515
Chestnuts, fresh	16.0	37.8	5.2	4.5	35.4	1.1	915
Coconuts	§48.8	7.2	2.9	25.9	14.3	.9	1,295
Hickory nuts	62.2	1.4	5.8	25.5	4.3	.8	1,145
Pecans, polished	53.2	1.4	5.2	33.3	6.2	.7	1,465
Peanuts	24.5	6.9	19.5	29.1	18.5	1.5	1,775
Walnuts, black	74.1	.6	7.2	14.6	3.0	.5	730
Walnuts, English	58.1	1.0	6.9	26.6	6.8	.6	1,250
Miscellaneous:							
Chocolate	....	5.9	12.9	48.7	30.3	2.2	5,625
Cocoa, powdered	....	4.6	21.6	28.9	37.7	7.2	2,160
Cereal coffee, infusion (1 part boiled in 20 parts water) ¶	....	98.2	.2	....	1.4	.2	30

* Plain confectionery not containing nuts, fruit, or chocolate.

† Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skin, seeds, etc. The amount varies with the method of preparing the vegetables, and cannot be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

†† Fruits contain a certain proportion of inedible materials, as skin, seeds, etc., which are properly classed as refuse. In some fruits, as oranges and prunes, the amount rejected in eating is practically the same as refuse. In others, as apples and pears, more or less of the edible material is ordinarily rejected with the skin and seeds and other inedible portions. The edible material which is thus thrown away, and should properly be classed with the waste, is here classed with the refuse. The figures for refuse here given represent, as nearly as can be ascertained, the quantities ordinarily rejected.

§ Milk and shell.

¶ The average of five analyses of cereal coffee grain is: Water 6.2, protein 13.3, fat 3.4, carbohydrates 72.6, and ash 4.5 per cent. Only a portion of the nutrients, however, enter into the infusion. The average in the table represents the available nutrients in the beverage. Infusions of genuine coffee and of tea like the above contain practically no nutrients.

functions. At the same time the blood stream carries away the waste which the exercise of these functions has produced. The living body tissue has the power of choosing the necessary materials from the blood and building them into its own structure. Just how this is done cannot be explained. That portion of the food which the digestive juices cannot break up into units suitable for assimilation, or which for some reason escapes digestion, is periodically excreted as fæces. This material includes not only indigestible material and particles of undigested food, but also the so-called metabolic products, i.e., residues of the digestive juices, bits of the lining of the alimentary canal, etc. For discussions of other excretory products, see URINE; SWEAT; RESPIRATION, ORGANS OF.

The thoroughness of digestion of any food may be learned most satisfactorily by experiments with man, although experiments are also made by methods of artificial digestion. In the experiments with man both food and fæces are analyzed. Deducting the amounts of the several nutrients in the fæces from the total amounts of each nutrient consumed shows how much of each was digested. The results are usually expressed in percentages and spoken of as coefficients of digestibility. From a large number of experiments with man it has been calculated that on an average the different groups into which food may for convenience be divided have the following coefficients of digestibility and fuel value per pound:

TABLE II. — COEFFICIENTS OF DIGESTIBILITY AND AVAILABILITY OF ENERGY OF DIFFERENT GROUPS OF FOOD

KIND OF FOOD	Protein	Fat	Carbohydrates	Availability of energy
	Per cent	*Per cent*	*Per cent*	*Per cent*
Meat and fish	97	95	..	87
Eggs	97	95	98	89
Dairy products	97	95	98	93
Total animal foods of mixed diet	97	95	98	89
Cereals	85	90	98	91
Legumes, dried	78	90	97	83
Sugars and starches	..	..	98	98
Vegetables	83	90	95	91
Fruits	85	90	90	88
Total vegetable foods of mixed diet	84	90	97	92
Total food	92	95	97	91

By the aid of these factors and the figures for the composition of food, the digestible nutrients in different materials may be calculated. Such data may be found in the usual reference works on food and nutrition.

Ease and Quickness of Digestion. As a general thing, the term "ease of digestion" refers to the agreement or disagreement of a food with an individual, and "quickness of digestion" to the length of time food remains in the stomach—which is only a step in digestion (though an important one, particularly for protein foods), for digestion continues after the food has passed into the intestine, where fats and carbodydrates are digested as well as any protein not digested in the stomach. The length of time food remains in the stomach has often been studied. It varies with many factors, including the quantity eaten, the kind and the mixture of foods. Small test meals may disappear from the stomach in one to four hours, and a test meal less abundant than an ordinary hearty dinner only after seven hours.

The period of digestion, as a whole, varies apparently with individuals and circumstances. It is a common thing for persons to excrete as fæces on one day the residue from the food eaten the day before.

Agreement of Food with Individuals. Digestibility is often confused with another very different thing, viz., the agreeing or disagreeing of food with the person who eats it. Different persons are differently constituted with respect to the chemical changes which their food undergoes and the effect produced, so that it may be literally true that "one man's meat is another man's poison." Milk is for most people a very wholesome, digestible, and nutritious food, but there are persons who are made ill by drinking it. They should avoid it. Some persons have to avoid strawberries. Such illness is ascribed to the reaction known as anaphylexis (q.v.). Every man must learn from his own experience what food agrees with him and what does not.

Metabolism Experiments. As already stated, a knowledge of food and its uses in the body is obtained from studies of composition, digestibility, etc., and from complicated experiments, in some of which the balance of income and outgo of matter and energy is studied. The latter are called metabolism experiments, the balance of matter being measured in terms of nitrogen, or of nitrogen and carbon, and sometimes other elements also, and the balance of energy being measured in terms of heat. In determining the balance of income and outgo of nitrogen, special attention is paid to the amounts of this constituent in food, urine, and fæces. When the balance of carbon is also taken into account, a respiration apparatus is very convenient and almost necessary. This apparatus permits of the measurement and analysis of the respiratory products, since these contain a large part of the carbon (as carbon dioxide) excreted from the body. Various forms of respiration apparatus have been devised within the last 50 years, among the most important being those invented by Pettenkofer and Voit, in Munich. They consist of metal-walled chambers, large enough for the subject (sometimes a man, sometimes a dog, sheep, or other animal) to live in comfortably for several days, and are furnished with devices for pumping air through, and measuring and analyzing it as it enters and as it leaves the chamber. With such an apparatus it is possible not only to measure all the food and excreta, but also the materials given off from the lungs in the breath, and to make accurate determination of the matter entering and leaving the body. A still more elaborate apparatus, by which not only all the matter passing in and out of the body may be measured, but also all the heat given off from it, is called a respiration calorimeter—i.e., a machine for measuring both the respiratory products and the heat given off by the body. It is like the respiration apparatus, except that it is furnished with devices for measuring temperatures.

Several have been built in Europe and in the United States within the last 30 years, among the most successful being those by Professor Rubner and Professor Rosenthal in Germany, and the type devised by Professors Atwater and Rosa and their associates. The latter form, which represents a great advance on any previously devised, was elaborated at Wesleyan University in connection with the nutrition investigations carried on under the auspices of the Office of Experiment Stations of the United States Department of Agriculture. This apparatus is now in the laboratories of the United States Department of Agriculture, where it is used for experimental purposes. It has been improved in many ways, particularly by the adoption of devices for automatically regulating and recording temperatures. Its main feature is a metal-walled chamber so constructed that heat cannot pass in or out through the walls, and fitted with devices for maintaining and measuring a ventilating current of air, for sampling and analyzing this air, for removing and measuring the heat given off within the chamber, and for passing food and other articles in and out of the chamber. The respiration chamber is furnished with a folding bed, chair, and table, with scales and with appliances for muscular work, and has a telephone connection with the outside. The ventilating air current is used over and over again, oxygen being supplied to replace that used by the subject, and the carbon dioxide and water of respired air being removed from the air current after it leaves and before it again enters the respiration chamber. The subject stays in the respiration chamber for a period varying from several hours to a number of days, during which time careful analyses and measurements are made of all material which enters the body in the food and of that which leaves it in the breath and excreta. Record is kept of the

TABLE III.—RESULTS OF DIETARY STUDIES IN THE UNITED STATES AND OTHER COUNTRIES

PERSONS	Total protein eaten	Energy of total diet	Digested protein	Energy utilized
United States:	*Grams*	*Calories*	*Grams*	*Calories*
Men at hard muscular work—				
Artisans, laborers, etc., average of 24 studies	*177	†6,485	162	6,090
Athletes, average of 19 studies	198	4,980	182	4,510
Men at moderate muscular work: Farmers, artisans, laborers, etc., average of 162 studies	100	3,685	92	3,425
Men not employed at muscular occupations: Business men, students, etc., average of 51 studies	106	3,560	98	3,285
Men with little or no muscular work: Inmates of institutions, average of 49 studies	86	2,820	80	2,600
Very poor working people, average of 15 studies	69	2,275	64	2,100
Canada: Factory hands, average of 13 studies	108	3,735	99	3,480
West Indies: Farmers, light work, Leeward Islands	82	....	75	3,085
Ireland: Workingmen	98	....	90	3,107
England: Workingmen	89	....	82	2,685
Scotland:				
Workingmen	108	....	99	3,228
Students	143	....	132	3,979
Finland:				
Workingmen	114	....	105	3,011
Workingmen (hard work)	167	....	150	4,378
Students	157	....	144	3,984
Sweden:				
Workingmen	134	....	123	3,281
Workingmen (hard work)	189	....	174	4,557
Students	127	....	117	3,032
Russia:				
Factory hands	119	....	109	3,194
Miners (hard work)	155	....	143	4,000
Northern Italy: Laborers	125	....	115	3,655
Southern Italy: Laborers	148	....	136	4,400
Italy: Farmers and mechanics	125	....	115	3,400
Germany:				
Workingmen (hard work)	134	....	123	3,061
Farmers	137	....	126	4,530
Professional men	111	....	102	2,511
France:				
Men (light work)	110	....	101	2,750
Farmers (south of France)	149	....	137	4,570
Belgium:				
Workingmen	92	....	84	3,000
Farmers	136	....	125	4,370
Poland: Well-to-do families	121	....	111	3,015
Japan:				
Laborers	118	....	103	4,415
Laborers (hard work)	158	....	137	5,050
Farmers	102	3,091	94	2,823
Professional and business men	87	....	75	2,190
Students	98	....	88	2,800
Java: Men (light work)	73	....	67	2,500
Philippines: Native of Tay Tay:				
Average person	90	2,700	83	2,457
Man at hard work	100	3,100	92	2,821
China, Lao-Kay: Laborers	91	....	83	3,400
Anam: Laborers	134	....	123	3,866
Egypt: Native laborers	112	....	103	2,825
Congo: Native laborers	108	....	99	2,812

* 100 grams equal 0.22 pound.

† The calorie is the unit used to measure heat. One calorie equals nearly 1.54 foot tons.

energy given off from the body as heat and muscular work. The difference between the material taken into and that given off from the body is called the balance of matter and shows whether the body is gaining or losing material. The difference between the energy of the food taken and that of the excreta and energy given off from the body as heat and muscular work is the balance of energy, and if correctly estimated should equal the energy of the body material gained or lost. With such apparatus it is possible to learn much of the real nutritive value of foods, and what effect different conditions of nourishment will have on the human body. In one experiment, e.g., the subject might be kept quite at rest, and in another do a certain amount of muscular or mental work, with the same diet as before. Then, by comparing the results of the two, the use which the body makes of its food under the different conditions could be determined.

Dietaries and Dietary Standards. The information gained from a study of the composition and nutritive value of foods may be turned to practical account by using it in planning diets for different individuals or classes of individuals, or in estimating the true nutritive value of the food actually consumed by families or individuals. By comparing the results of many such investigations with the results of accurate physiological experimenting it is possible to learn about how much of each of the nutrients of common foods is needed by persons of different occupations and habits of life, and from this to compute standards representing the average requirements for food of such persons. The plan followed in making dietary studies is, briefly, as follows: Exact account is taken of all the food materials (1) on hand at the beginning of the study, (2) procured during the study, and (3) remaining at the end. The difference between the third and the sum of the first and second is taken as representing the amounts used. From the figures thus obtained the amount of the different food materials and the amount of the different nutrients furnished by them are calculated. Deducting from this the weights of the nutrients found in the kitchen and table refuse, the amounts actually consumed are obtained. Account is also taken of the meals eaten by different members of the family or groups studied and by visitors, if there are any. From the total food eaten by all the persons during the entire period the amount eaten per man per day may be calculated. In making these calculations due account is taken of the fact that women and children eat less than men performing the same amount of work.

It is a matter of convenience to record the results of dietary studies in like terms as regards the age and sex of the persons included, and the amount per man per day seem the most satisfactory basis of comparison.

Every one knows that the young child takes less food than the older, and that there are variations through adolescence to the period of full vigor and of old age. The numerous food investigations which have been carried on have furnished data for estimating the amounts consumed by children of different ages and by men and women at different periods of life, and general factors have been deduced which are shown in the table below, and which are used in calculating the results of dietary studies to the uniform basis "per man per day."

In this comparison a man in full vigor at moderate work has been selected as the unit for comparison and assigned the value 100. The greater or smaller requirements of men at more severe work, and of women and children, are shown by values greater or less than 100, as the case may be.

RELATIVE VALUES FOR FOOD REQUIREMENTS OF PERSONS OF DIFFERENT AGE AND OCCUPATION AS COMPARED WITH A MAN IN FULL VIGOR AT MODERATE WORK

Man, period of full vigor:	
At moderate work	100
At hard work	120
Sedentary occupation	80
Woman, period of full vigor:	
At moderate work	80
At hard work	100
Sedentary occupation	70
Man or woman:	
Old age	90
Extreme old age	70–80
Boy:	
15 to 16 years old	90
13 to 14 years old	80
12 years old	70
10 to 11 years old	60
Girl:	
15 to 16 years old	80
13 to 14 years old	70
10 to 12 years old	60
Child:	
6 to 9 years old	50
2 to 5 years old	40
Child under 2 years old	30

It is evident from the figures quoted that there is an increase in food consumption from infancy until full vigor and that the food requirements again diminish in old age. The figures also show that during early youth and old age sex does not have a marked effect on food requirements, but from the time growth is complete until old age a woman requires less food than a man engaged in the same kind of work.

Other factors which have an influence on food requirements are climate, the bearing and nourishment of children, the pathological conditions due to diseases of different sorts, and various abnormal conditions.

As regards climate and seasons, the general conclusion reached is that more energy is required in cold than in warm weather, and it has been estimated that in winter the energy requirement is greater by 800 calories than in summer. Acute and chronic diseases and other abnormal conditions have a very decided effect on protein and energy requirements, and a knowledge of such conditions with reference to the kind and amount of food needed must form the basis of rational invalid dietetics, one of the most important subjects in the practice of medicine.

Just as some persons apparently normal in other respects cannot distinguish between certain colors, so others are apparently in perfect health and vigor whose food requirements differ markedly from those of the average normal individual. Such exceptions are interesting, but need not be considered in general discussions of protein and energy requirements.

Table III shows the average results of a large number of dietary studies made in the United States and other countries with persons performing different amounts of muscular work and living under different conditions. As a result of the dietary studies which have been made and other data, certain dietary standards have been devised which, it is believed, may serve as useful guides for home management. The following table gives such data for a man at moderate muscular work, on the basis of food purchased, food eaten, and food digested.

TABLE IV.—DIETARY STANDARD FOR MAN IN FULL VIGOR AT MODERATE MUSCULAR WORK

	Protein	Energy
	Grams	*Calories*
Food as purchased................	115	3,800
Food eaten..........................	100	3,500
Food digested.....................	95	3,200

The dietary standard expressed in terms of protein and energy only does not, of course, take account of the proportion of fats and carbohydrates present, and from the theoretical standpoint it is not necessary to do so, as it is immaterial which of these two classes of nutrients supplies the energy. From a practical standpoint, however, the proportion is of the greatest importance on account of its relation to the wholesomeness and palatability of the diet. The proportions which are usually consumed in the American diet are not far from 150 grams fat and 350 grams carbohydrates per 100 grams protein.

Higher dietary standards and lower ones (particularly with reference to protein) have been proposed, but none of them represent the extremes under which man has lived in apparent health and comfort. All the standards are rather attempts—based on evidence which has seemed to the purpose to justify the conclusion—at an optimum standard. The greatest variations in different standards are in the protein, and it seems fair to say that the matter will not be settled finally until more evidence is available. With respect to energy, experiments with the respiration calorimeter have shown that the value given in the standard quoted above is a reasonably close expression of the actual body requirement.

To be most useful, dietary standards should take into account the amount of ash constituents required by the body, for it is well known that mineral matters of different sorts are essential for use in forming bones and other body tissues for the repair of the body and for other purposes. A recent estimate of the mineral matter required per man per day calls for the following amounts:

ESTIMATED AMOUNT OF MINERAL MATTER REQUIRED PER MAN PER DAY

	Grams		*Grams*
Phosphoric acid (P_2O_5) .	3–4	Calcium oxide....	0.7 –1.0
Sulphuric acid (SO_3) ...	2–3.5	Magnesium oxide	0.3 –0.5
Potassium oxide	2–3	Iron...........	0.006–0.012
Sodium oxide..........	4–6	Chlorine	6 –8

Other mineral elements, as silica, iodine, and fluorine, are required, but apparently in much smaller quantities.

Nearly all the ordinary foods of both animal and vegetable origin furnish some of these constitutents. There is good reason to believe that with the ordinary mixed and reasonably generous diet the body demands for mineral matter may be met, and that when for any reason a deficiency of some ash constituent exists it may be supplied by using certain of the usual foods in greater proportion. For instance, a deficiency of calcium may be readily corrected by using larger amounts of milk and cheese, or of iron by using larger quantities of green vegetables, fruits, and the coarser milling products of the cereal grains.

It is not necessary that the food each day equal exactly the amount called for by the dietary standards. A deficiency one day is made good by an excess the next, and vice versa. Such dietary standards do not take into account differences in the nutritive value of proteins due to variations in the number and nature of the amino acids of which they are composed, nor do they take into account the vitamins or other essential substances present in minute amounts. Discussions based on such dietary standards assume that a reasonably varied, mixed diet will meet all requirements which would involve these factors. As knowledge accumulates the whole matter will no doubt be put on a more exact basis.

To learn whether any given diet conforms to the standard, the amount of nutrients and energy (or, what serves the same purpose, protein and energy) must be ascertained for a day or for a longer period by the method described above for making a dietary study. If the diet is found to be deficient in protein or in energy, food materials should be added which supply protein or are especially valuable as sources of energy (i.e., foods rich in fats and carbohydrates). If more protein or energy be provided than the standard demands, the food materials should be correspondingly diminished. In ordinary mixed diet, which seems to be the one best suited to man in health, the chief sources of protein are meat, fish, cheese, and milk, among animal foods, and the cereals and legumes among vegetable foods. About nine-tenths of the fat in the ordinary diet is obtained from the animal foods, while the vegetable foods furnish approximately nine-tenths of the carbohydrates.

Too much food is as bad as too little and occasions a waste of energy and strength in the body as well as a waste of nutritive material.

The palate revolts against a very simple and unvaried diet, and for this reason the nutrients are usually supplied from a variety of articles—some of animal, some of vegetable origin. With a varied diet it is also easier to secure the proper proportions of protein to fats, carbohydrates, ash constituents, and such substances as vitamins, or others needed at least in small quantity for normal nutrition.

Preparation of Food—Cooking. The cooking of food has much to do with its nutritive value. Many articles which, owing to their physical condition or other cause, are quite unfit for nourishment when raw are very nutritious when dressed for the table and cooked. It is also a matter of common experience that a well-cooked food is wholesome and appetizing, while the same material badly cooked is unpalatable. There are three chief purposes of cooking. The first is to change the physical condition so that the digestive juices can act upon the food more freely. Heating often changes the structure of food substances very materially, so that they are more easily chewed and more readily and thoroughly digested. The second is to make food more appetizing by improving the appearance, the flavor, or both. Food which is attractive to the taste quickens the flow of saliva and other digestive juices, and thus digestion is aided. The third is to kill by heat any disease germs, parasites, or other dangerous organisms food may contain. This is often a very important matter and applies to both animal and vegetable foods. The fourth is to sterilize foods so that they will keep longer. The cooking of meats not only develops the pleasing taste and odor of extractives and that due to the browned fat and tissues, but it softens and loosens the connective tissues and thus makes the meat more tender. Extreme heat, however, tends to coagulate and harden the albuminoids of the lean portions and also weakens the flavor of extractives. If the heating is carried too far, a burned or charred product of bad flavor results. Meats lose weight in cooking. A small part of this is due to escape of meat juices and fat, but the chief part of the material lost is simply water. The nutritive value of a meat soup depends upon the substances which are dissolved out of the meat, bones, and gristle by the water. In ordinary meat broth these consist almost wholly of salts and extractives. The latter are very agreeable and often most useful as stimulants, but have little or no value as actual nutriment. The principles which underlie the cooking of fish are essentially the same as with meats. See FISH AS FOOD.

In many vegetables the valuable carbohydrates, chiefly microscopic starch grains, are contained in tiny cells with comparatively thick walls on which the digestive juices have little effect. The heat of cooking, especially with water, softens and often ruptures these walls and also makes the starch more soluble; without water it may also caramelize a portion of the carbohydrates and produce agreeable flavors in this and other ways.

In breads, cakes, pastry, and other foods prepared from flour, the aim is to make a palatable and lighter porous substance, more easily acted upon in the alimentary canal than the raw materials could be. Sometimes this is accomplished simply by means of water and heat. The heat changes part of the water in the dough into steam, which in trying to escape forces the particles of dough apart. The protein (gluten) of the flour stiffens about the tiny bubbles thus formed, and the mass remains porous even after the steam has escaped. More often, however, other things are used to "raise" the dough—such as yeast and baking powder. The baking powder gives off the gas carbon dioxide, and the yeast causes fermentation in the dough by which carbon dioxide is produced. This acts as the steam does, only much more powerfully. When beaten eggs are used, the albumen incloses air in bubbles, which expand, and the walls stiffen with the heat and thus render the food porous.

Pecuniary Economy of Food. Although the cost of food is the principal item in the living expenses of a large majority of the people, and although the physical welfare of all is so intimately connected with and dependent upon diet, very few of even the most intelligent have any ideas regarding the actual nutriment in the different food materials they use. In too many cases even those who try to economize know little as to the combinations which are best fitted for their nourishment and have still less information as to the relation between the real nutritive value of different foods and their cost.

There are various ways of comparing food materials with respect to the relative cheapness or dearness of their nutritive ingredients. For instance, from the proportions of available nutrients and energy in different food materials given in Table II we may calculate the cost of the different nutrients per pound and of energy per 1000 calories in any given material for which the price per pound is known. Such figures show the relative economy of the various foods as sources of protein and sources of energy. Of course the amount of energy that would be obtained in a quantity of any given material sufficient to furnish a pound of protein would vary with the amounts of fats and carbohydrates accompanying the protein; and on the other hand, the quantities of the different materials that would furnish 1000 calories of energy would contain different amounts of protein. The figures for cost of protein leave the carbohydrates and fats out of account, and those for energy take no account of the protein. Hence the figures for either protein or energy alone give a very one-sided view of the relation between nutritive value and money cost. A better way of estimating the relative pecuniary economy of different foods is found in a comparison of the quantities of both nutrients and energy which can be obtained for a given sum, say 10 cents, at current prices. Such tables are often found in works of reference.

While in the case of certain foods as purchased, notably meats, some waste is unavoidable, the pecuniary loss can be diminished, both by buying cuts which are suited to the family or group and in which there is the least waste, and by utilizing, carefully, portions of what is usually classed as refuse. Much waste may be avoided by careful planning to provide a comfortable and appetizing meal in sufficient amount, but without excess. If strict economy is necessary, the dearer cuts of meat and the more expensive fruits and vegetables should be avoided. With reasonable care in cooking and serving, a pleasing and varied diet can be furnished at more moderate cost than when no attention is paid to such matters. It should not be forgotten that the real cheapness or dearness of a food material depends not only on its market price, but also on the cost of its digestible nutrients. It should always be remembered that "the ideal diet is that combination of foods which, while imposing the least burden on the body, supplies it with exactly sufficient material to meet its wants," and that any disregard of such a standard must inevitably prevent the best development of our powers.

In general, it may be said that, other things being equal, the cost of the daily food is determined by the proportion of the total expended for such staple articles as bread, meat, butter, eggs, and common vegetables, to the expenditure for accessory foods, such as expensive fruit, out-of-season vegetables, fancy sweets, and the like, which, as ordinarily used, contribute more to the attractiveness of the diet than they do to its nutritive value.

It is in the combination, with due reference to economy, of staple articles, many of them lacking in distinctive flavor, with foods and dishes which possess flavor in marked degree, that one of the greatest opportunities for skillful management in the household occurs. Careful buying, good cooking, and careful serving to suit the demands of individual appetites in the family so that little is left on plates to be thrown away are important factors in economical living, as is also the careful use of all material left over in the kitchen or on the table after the family has been served.

An opportunity may be found for lessening the expenses in many families by cutting down the waste, particularly in such foods as meat, butter, and others which are comparatively expensive.

Hygienic Considerations. Scrupulous neatness should always be observed in keeping, handling, and serving food. If ever cleanliness is desirable, it must be in the things we eat, and every care should be taken to insure it for the sake of health as well as of decency. Cleanliness in this connection means, not only absence of visible dirt, from worms and other parasites, but freedom also from undesirable bacteria and other minute organisms. If food, raw or cooked, be kept in dirty places, peddled from dirty carts, prepared in dirty rooms and in dirty dishes, or exposed to foul air, or to flies and other insects, disease germs and other offensive and dangerous substances can easily get in. Food and drink may, in fact, be very dangerous purveyors of disease. The human hand soiled with fæces or urine is very often the agent which conveys the "germs" to the food. Experiments have clearly shown that fruits, vegetables, and other foods may readily acquire undesirable or dangerous bacteria if exposed to street dust. The bacteria of typhoid fever sometimes find their way into drinking water; those of typhoid and scarlet fevers and diphtheria into milk. Thus sickness and death are brought to large numbers of people. Oysters which are taken from the salt water where they grow, and "floated" for a short time in brackish water near the mouth of a stream, have been known to be affected by typhoid-fever germs brought into the stream by the sewage from houses where the dejections from patients had been thrown into the drains. Celery or lettuce has been found to convey typhoid fever from having grown in soil containing typhoid germs. Insects may, and often do, carry filth and disease germs to food—and none more often than flies.

Food materials may also contain parasites, like tapeworms in beef, pork, and mutton, and trichinæ in pork, which are often injurious and sometimes deadly in their effect. This danger is not confined to animal foods. Vegetables and fruits may be contaminated with eggs of numerous parasites from fertilizers used in growing them. Raw fruit and vegetables should always be very thoroughly washed before serving if there is any doubt as to their cleanliness. If the food is sufficiently heated in cooking, all organisms are killed. Sometimes food undergoes decomposition in which it is claimed injurious chemical compounds, so-called ptomaines, are formed. More commonly the illness is due to the accidental contamination of the food with disease-producing microörganisms which grow rapidly in it.

Food Inspection is maintained in most States, and after several years of efforts a national pure-food law was passed by Congress in June, 1906. This law prohibits the shipment from one State to another, or to foreign countries, of foods, condiments, drugs, confectionery, liquors, etc., which are adulterated or misbranded. The law is comprehensive and is specific in defining what constitutes adulteration and misbranding. Its execution is largely placed in the hands of the United States Department of Agriculture, which is directed to maintain an inspection. Penalties are provided for infractions of the law, consisting of fine, imprisonment, or both. Many of the States and many other countries have enacted such pure-food legislation also.

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FOOD IN PLANTS is generally spoken of as serving two purposes, by furnishing (*a*) building material and (*b*) energy. The latter is rendered available for work in the organism by respiration or fermentation (q.v.) of the food. Some authors use food in its application to green plants to include only organic compounds, mainly carbohydrates, fats, and proteins, and do not consider the inorganic substances, carbon dioxide, water, and various necessary salts, out of which these are synthesized, under the term. Others use the term in a wider sense, including under it the inorganic nutrients mentioned above as well as the organic substances. Still others prefer to avoid the term in connection with plants because of its indefiniteness. It would seem better to use the term in the narrower sense and "nutrients" as the broader term. Even in green plants, however, such a restriction of the term meets difficulty. For example, we know little about how the essential metals (obtained in the form of salts) enter into the composition of the plant body, except magnesium, which is a part of the chlorophyll molecule.

Of the nonchlorophyllous plants, many thrive on carbohydrates along with various inorganic salts. These can synthesize their fats from carbohydrates and their proteins from carbohydrates and the necessary salts. Others demand the nitrogen as well as the carbon in the form of complex organic compounds. The pathogenic bacteria often demand nitrogen in the form of peptones or proteins.

There are a number of colorless autotrophic forms (sulphur, nitrite, nitrate, and other bacteria) which oxidize inorganic substances (hydrogen sulphide, sulphur, ammonia, nitrite, etc.) as a source of energy, both for synthesizing organic materials, that make up their bodies, from carbon dioxide and water along with the necessary salts, and for carrying on other physiological processes. In these forms, at least, inorganic materials through direct oxidation fill the second need of food, viz., source of energy.

FOOD, Preservation of. Most of the processes of preserving food which are practiced to-day were known long before the reasons for them were understood. It was recognized that molds grew, that liquids fermented, and that other similar changes took place, and they were explained on the theory of spontaneous generation of life. In 1860 Pasteur was awarded a prize for his work overthrowing the theory of spontaneous generation. In this and later work he showed that fermentative, putrefactive, and other changes which took place when foodstuffs or other material were kept exposed to air, were due to the presence and growth of minute forms of life, and that if these forms of life were once destroyed the changes would not take place unless they were again introduced. The great development of bacteriology, the subject of most importance in relation to food preservation, is the outgrowth of Pasteur's investigations.

Preservation of food is of two general sorts, viz., temporary and long continued. *Temporary preservation* is secured by protecting foods from loss of moisture (drying or wilting); from being too moist; from losing flavor or losing color (fading); from contact with dirt, dust, insects and vermin; and so on. It is accomplished by keeping the foods cool in a refrigerator or in earlier times in the spring house or suspended in a covered bucket or pail hung in the well; keeping foods moist by storing them, as, e.g., bread or cake in a special box or jar; or by wrapping green vegetables in a damp cloth and, in general, by suitably protecting them, keeping them from dust, insects, etc., by the use of the usual household utensils, containers, cupboards, storerooms, etc. Protection from molds, ferments, and other microörganisms is also important and usually accomplished fairly well for the short period by taking the precautions referred to.

Long-continued preservation involves protection of foodstuffs from the action of yeasts, molds, and bacteria, as well as from the atmosphere, and often from light, from insects, vermin, etc., and from mechanical losses. This presupposes suitable protective coverings and containers, but the principal point involved is the preventing of the growth of the microscopic forms of life referred to. (See Bacteria.) These minute organisms, like other forms of life, require for their growth suitable nutritive substances, and moisture as well as proper light and heat conditions. They are also influenced by the presence or absence of oxygen and by the osmotic pressure of the medium in which they are grown. The influence of these factors varies with the different types. The principal preserving processes employed to bring about the desired hindrance or prevention of the growth of microörganisms which cause fermentative and putrefactive and other changes in food are destruction of any already present and preventing others from reaching the foods. The processes followed are the removal of moisture (desiccation, drying, and evaporating); exclusion of air (vacuum, immersion in fat or oil, covering with fat, etc.); low temperature (cooling and refrigeration); high temperature (pasteurization and sterilization, as in canning, tinning, bottling, etc.); the use of preservatives (household—salt, sugar, wood smoke, spice, vinegar, alcohol, e.g., brandy, etc.; chemical—formalin, benzoic acid, etc.); and the employment of fermentative, putrefactive, bacterial, and enzymic action (souring and special fermentations of milk, cheese ripening, fermentation with addition of salt as in sauerkraut making, etc.) of a desirable character, which itself prevents an undesirable kind from taking place.

For the successful carrying out of the various operations some basal facts must be realized—e.g., that the various parasites and saprophytes which cause deterioration and decay have maximum, minimum, and optimum growth temperatures; that many of the microörganisms occur in both vegetative and spore conditions; and that these differ with respect to the thermal death point. The thermal death point is also influenced by the acid or alkaline reaction of the media, which explains, e.g., the ease of canning fruits which are acid as compared with the difficulty experienced in the home canning of vegetables which are usually nonacid. The protective action upon the thermal death point of colloid solution is also important. As an illustration, milk, a colloidal solution, is relatively difficult to sterilize. The influence of osmotic pressure upon growth of microörganisms is shown, e.g., by a heavy sugar sirup which acts as a preservative because of suitable differences in density. In a similar way condensed milk is too dense for the ready growth of microorganisms causing decay. Food preservation must also take into account in general the widespread distribution of microörganisms in the atmosphere, etc., and their general relation to dust and dirt.

Drying or desiccation is probably the oldest, as it is the simplest method of preserving grains, fruits, vegetables, and even meats from decay. Often this was combined with parching, as in the parched oatmeal of the Highlanders or the parched corn of the American Indians. During the nineteenth century this method of preserving foods was developed into a great commercial enterprise by the application of scientific principles. A great advance was made in the desiccation or dehydration by the introduction of methods which permitted rapid drying at a comparatively low temperature in vacuum, or partial vacuum which permits the removal of water without as great changes in the flavor and color as were brought about by the long-continued drying of the older method. To insure the best quality when used, most dried or desiccated fruits and vegetables should be immersed in water before they are cooked in order that they may slowly regain their original moisture content. Evaporated or condensed milks are usually mixed with water before using, while milk powders, egg powders, and similar things are handled in various ways to suit different culinary requirements, as are also dried fish and dried meats.

The exclusion of air by immersion in oil or fat is a common method of preservation, an illustration being the covering of potted meats with a layer of fat. A familiar household application is the pouring of a spoonful of olive oil on top of the fruit in an open can, bottle of olives, or jar of pickles. A similar result is obtained when melted paraffine is poured over the top of jelly or preserves, which hardens to an impervious layer and so hinders or prevents the growth of molds.

Preservation by low temperature has developed very greatly in recent years, and *cold storage* has become an enterprise of great importance. Favorable temperatures for holding various food products in good condition have been learned by experiment and observation, as has also the maximum time which various foods may be held without deterioration characterized by marked loss of quality, for it must be remembered that while cold storage greatly retards, it does not in many cases entirely prevent the changes brought about by the ferments or enzymes normally present in plant and animal tissues, or those due to the bacteria and other microörganisms which are almost always accidentally present. See REFRIGERATION; PACKING INDUSTRY.

Preservation by high temperature has found its greatest application in pasteurization and in sterilization. The time of heating as well as the temperature is important. In general, the higher the temperature, the shorter the time required. Pasteurization involves heating at a lower temperature than that of boiling water; in practice in the pasteurization of milk heating to about 145° F. for 30 to 45 minutes. Sterilization is very often accomplished by heating at 212° or at a higher temperature for a shorter period than is found necessary at the temperature of boiling water. Higher temperatures are maintained by heating in a water bath made dense, as, e.g., by the addition of common salt or in process kettles involving the use of dry steam or superheated steam. It has also been found that fractional sterilization is often a desirable process, i.e., the repeated sterilization for a short period at intervals of a day or two. See STERILIZED FOOD.

Canning (tinning or bottling) **and preserving.** These terms are sometimes used as synonyms and sometimes with different meanings. In the case of fruits canned (tinned or bottled) goods usually contain a smaller portion of sugar to pulp and juice than preserves or marmalades. Jellies are made from sugar and juice without pulp. Canned and preserved meat, dairy, and fish products have distinctive names which vary more or less in English-speaking countries.

The process of hermetically sealing food to preserve it for future use was discovered in 1795 by a Frenchman named Nicholas Appert. Fourteen years later Napoleon gave him a prize of 12,000 francs for his invention. He continued his researches through life, spending all his money upon them, and, like many other inventors, died alone, in poverty and neglect. In 1810 an English patent was taken out for Appert's process, from which, however, the latter derived no benefit. From England the knowledge of the process was soon brought to America. Lobsters and salmon were the first goods canned commercially in America, but in 1825 fruits and vegetables were also canned.

Glass jars were at first used, but their general use was soon abandoned on account of their perishability, bulkiness, and expensiveness, and in 1823 Thomas Kensett secured a patent on the use of tin cans for this purpose, and this material has since been very commonly employed. Earthenware jars have always been popular for some kinds of goods, particularly jams and other thick fruit preserves, and for potted meats, cheese, etc.

In the modern canning factory the goods are immediately sorted and placed in the cans, and the caps soldered on. In each cap there is a hole for the escape of gas and steam during the cooking process. The cans are then placed in a steel boiler, the cover of which is bolted down, and steam turned in, which sterilizes the contents by heating to the proper temperature under pressure. They are then hermetically sealed by placing a drop of solder on each vent hole and are ready for shipment. Not only raw foods, but a large variety of made dishes, as soups, sauces, and jams, are put up in this way.

The canning of fish requires greater care than that of fruit and vegetables, because fish decays so much more rapidly. The salmon canneries of the Pacific are usually located on the water's edge. The fish immediately upon receipt is subjected to an ice-cold bath and after being dressed is again washed. It is cut up by machinery into pieces the length of the can and is then subjected to such intense heat that not only the fish but the bones are cooked so that they will crumble. The cans are tightly soldered for the first cooking. They are then tested by the process known as "blowing" or "venting," which consists in making a small perforation in each can to permit the escape of steam. The can is then placed in another steam-heated retort for the final cooking, after which it is given a lye bath to remove grease. After cooling the cans are lacquered and labeled, ready for market.

The canning of oysters has been encouraged by various improvements.

The objection has been urged against the use of tin cans that the natural acids of fruits, vegetables, and meats act upon the tin and solder in such a way as to form metallic salts or metallic compounds that are injurious to health. It has been demonstrated that the amount of tin passing into solution depends upon the acidity of the material canned, the age of the sample, and the quality of the plate. Heavy plated tin resists the action of acid solutions better than the light plates frequently employed. Recent experiments indicate the advantage of coating the inside of tin cans with a lacquer or varnish.

Canning and preserving are very commonly combined with the use of household preservatives, as spice and vinegar in case of fruits;

salt in case of vegetables; salt, spice, and vinegar in pickle making; and salt, spice, etc., in canning meats and meat products. Commercial preservatives, as benzoic acid, benzoate of soda, formalin, and others, have also been so extensively used in canning and preserving and in other ways that the matter has in most countries been regulated by legislative enactment. See ADULTERATION.

Most of the methods of long-continued preserving of foods are practiced on a household as well as a commercial scale. The processes followed in each case are the same, though the equipment and technique differ, as is natural, since household methods involve small quantities as compared with the enormous amounts handled in commercial food preserving.

Statistics of the Canning Industry. With respect to the extent of the canning and preserving industry of the United States, the latest available census report (1913) states that in 1909 the total number of establishments engaged in this business in the United States was 3767; the capital involved, $119,207,127. The enterprise gave employment on an average to 71,972 persons, of whom over two-thirds were wage earners, and paid out $26,945,466 in salaries. The establishments considered were those whose chief products are canned and preserved fruits and vegetables, including dried and packed fruits; those whose chief products are canned and cured fish, including pickled, smoked, and dried goods; those whose chief products are canned oysters and clams; and those whose chief products are pickles, preserves, jellies, sauces, etc. The combined cost of the materials used in all four branches of the industry in 1909 was $101,823,059, the value added by the manufacturing process, $55,278,000, and the value of the output, $157,101,000. This figure, however, did not include meats canned in general packing and slaughtering houses.

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For descriptive and statistical matter regarding the canning industry, consult Hune, "Canning and Preserving," in *Thirteenth Census of the United States*, "Manufactures," vol. x, part iii (Washington, 1913).

FOOD REGULATION. Normally the world production of food is adequate, though the margin is seldom large. In time of peace the provisioning of a nation is commonly regarded as an economic question, to be solved by the laws of supply and demand. Governmental regulation under these circumstances has usually been restricted to the encouragement of production; or it may seek to provide cheap foods by encouraging imports, as through the repeal of the Corn Laws in England in 1846.

In case of war, however, the question of the adequacy of the food supply may become a vital factor in the national existence. This was graphically illustrated in the World War, first in Germany when importation had been largely prevented, and subsequently with the Allies as well, because of the menace of the submarine. Under these circumstances the conservation of the food supply became of the gravest importance, and led to drastic regulations in all the belligerent countries, the neutral nations of Europe, and in lesser degree in practically every civilized country of the globe.

War-time Regulation of Food. The first comprehensive attempts at food regulation during the war were undertaken during the fall of 1914 by Germany, when expectations had faded of an early ending of hostilities. The chief food imports had been bread grains, 32,000,000 tons being consumed annually with an average production of 26,000,000 tons. It was expected to make up the deficit by stimulating agricultural production, the methods adopted including the guaranteeing of high prices to the producer, governmental control of seed and fertilizers, and governmental supply of farm labor during seeding and harvesting. These expedients proved unsuccessful, however, the grain crop falling below the average of prewar years. The feeding of wheat and rye to farm animals was also prohibited, but the edict proved unenforceable. The blockade shut out the importation of concentrated feeding stuffs, however, making necessary a heavy reduction of live stock. This in turn led to a serious shortage in milk and its products, and also in animal fats. Many attempts were made to insure an equitable distribution of the available supply through prior regulation, rationing of many foods, the compulsory use of substitutes when available, and similar expedients. This policy proved fairly successful as regards wheat and sugar, but much less so on other commodities. Its failure is attributed quite largely to the producers, who are reported to have consumed more than their pro rata share of foodstuffs, diverted another portion to the feeding of domestic animals, and sold large quantities to the well-to-do classes in disregard of the regulations.

In France the issuing of the governmental decrees affecting food began immediately after the outbreak of the war. These followed some of the general lines already described for the stimulation of production in Germany. In 1915 and 1916 laws were enacted giving the government the right to requisition wheat and flour and other cereal products for the civil population at a fixed price, and to make purchases abroad for civilian distribution. This was a material extension of the right of requisition for the army and navy. Maximum price laws followed on many foodstuffs, as well as decrees regulating the milling percentage of wheat, the consumption of meat and sugar, the amount and kind of food served in public eating places, and so forth.

English legislation to compel food conservation did not commence until 1916, but became fully as far-reaching as in France. A food controller was appointed to control the production, manufacturing, storage, transportation, distribution, purchase and sale, and use and consumption of any article of food. Minimum prices were guaranteed on wheat and oats, the breaking up of grazing and sod lands was required, and likewise the compulsory cultivation of fields according to the principles of good husbandry. Maximum and minimum prices and sales regulations were also prescribed on many commodities, as well as extensive regulation of public eating places, the use of sugar cards, and many like devices.

Italy ultimately adopted a virtual rationing plan, very closely regulating food consumption. Even in the neutral nations of Europe, wide regulatory powers were exercised by the governments as the war dragged on and the food shortage became a matter of vital concern.

Upon the entrance of the United States into the war, it was realized that one of its most important services would be the supplying of food to its Allies and that this policy would necessitate the close economy and coöperation of the entire nation. Efforts were promptly begun to enlarge Federal authority as to food control, and on Aug. 10, 1917, the Federal Food Production Act and the Federal Food Control Act became laws.

Under the Food Production Act the Secretary of Agriculture was given very broad authority to investigate conditions relating to food and agricultural supplies, with a view to making a quick survey of the country's food and feed resources, and to keep informed as to the situation. Increased appropriations were also granted to stimulate production in several ways. The Food Control Act authorized Federal control of foods and certain other necessaries, and prohibited willful destruction or waste, hoarding, and similar practices. A system of licensing various operations was authorized and the President under certain conditions was empowered to seize factories, packing houses, and other plants and operate them; to regulate feed, foods, fuels, and other supplies needed by the army and navy; and to purchase, store, and sell to the public wheat, flour, milk, beans, and potatoes. The use of foods for the production of distilled spirits and beverages was prohibited, and the President was also empowered to restrict the use of these materials for the production of malt or vinous liquors when deemed essential.

The United States Food Administration was created to administer the law, with Hon. Herbert Hoover in charge throughout its activities. A comprehensive system of licensing of millers, sugar refiners, and other manufacturers and distributors of the principal food commodities was adopted. The principal food handlers exempted from this provision were retailers whose gross business did not exceed $100,000 per year, but control was exercised indirectly over even this class through their sources of supply. Particularly close supervision was attempted in the case of wheat and flour, meat products, and sugar. Such expedients were resorted to as the restriction of retail purchases of sugar to as little as two pounds per person per month in August, 1918, compulsory purchases of wheat substitutes under the so-called 50-50 rule, the institution of wheatless Mondays and Wednesdays, meatless Tuesdays, and porkless Saturdays, and regulation of public eating places in various ways. As in England, much stress was laid upon voluntary coöperation, and it is probable that much of the substantial success obtained was due to the patriotic response to this appeal. Efforts were also made to reduce hoarding, curb profiteering in foodstuffs, and in general to promote in every way the winning of the war. Most of the legislation was specifically limited in duration to the war emergency, and with its expiration the usual methods of doing business were again gradually restored.

Regulation of Food Adulteration and Misbranding. The adulteration of foods seems to have been practiced ever since these commodities went into trade, and there are many instances of ancient laws for its regulation. One of the earliest food laws is probably that in the writings of Plato, about 350 B.C., providing that "the wardens of the market and the guardians of the law shall obtain information from experienced persons concerning the rogueries and adulterations of sellers, and to write up what the seller ought and ought not to do in each case." In England, laws forbidding the adulteration of food were adopted as early as the eighteenth century, and several specific statutes as regards coffee and tea were passed in the period of 1718 to 1776. In general, however, the principle that the purchaser must look after himself prevailed, the general doctrine of holding the vender responsible being comparatively modern. The first food law in the United States was probably that of Virginia in 1645, forbidding the adulteration of "wine and strong waters." Modern legislation, however, began late in the nineteenth century, one of the earliest States to act being Massachusetts, which has uniformly maintained food inspection since 1883.

An active campaign against the adulteration of food was carried on from 1870 to 1880, and bills seeking Federal legislation were introduced into Congress in the latter year. Not until 1906, however, was an effective Federal statute enacted, the Food and Drugs Act of that year, which still constitutes with limitations the existing law. This law was patterned after the Food and Drugs Act of 1899 of Great Britain, and fundamentally prohibits both adulteration and misbranding. It forbids interstate commerce in foods which have been adulterated or misbranded, or which are unwholesome or contain preservatives or other adulterations making them injurious to health, and it also prohibits the manufacture or sale of such products in the District of Columbia, Alaska, or the insular possessions. It covers foods, condiments, vegetables, and all sorts of drugs and medicines. Heavy penalties of fine and imprisonment may be imposed for violation of the law, and condemned goods in the process of transportation from one State to another, or to a foreign country may be confiscated.

The law is administered chiefly by the United States Department of Agriculture with the collaboration of other departments, the inspection work being centered in the Bureau of Chemistry.

Three law enforcement districts have been established, with headquarters at New York, Chicago, and San Francisco, together with a field inspection staff and a chemical staff located in sixteen cities. Close coöperation is maintained with State officials in its enforcement. Practically all of the States are also actively enforcing laws of their own as to intrastate traffic in foods and drugs. Considerable variation exists between the several States as to the scope and details of this legislation, their provisions being in some cases more drastic than the Federal law. See Packing Industry and Milk Adulteration and Control.

Other Forms of Food Regulation. In recent years the tendency has been to give increased attention to the sanitary aspects of the food supply. In most States inspection is now provided for bakeries, ice-cream plants, and similar food producing establishments. Likewise the methods of handling foods during transportation and distribution are matters of closer scrutiny.

Another matter regulated in about a dozen States is cold storage. The State laws are usually drawn from the double standpoint of assuring wholesome food and of preventing price enhancement by hoarding. In general a licensing system is adopted, under the supervision of the State Board of Health or the State Food Commission. Commodities are marked with the date of receipt and frequently with the date of withdrawal, the duration of storage is restricted, and periodical reports are required as to holdings. Federal legislation has been pending for several years along this line.

An important part of the work of the Federal Trade Commission, which seeks to regulate monopolistic and unfair trade practices, deals with food products. A report of this commission in 1919 directed public attention to the wide extension of activities in recent years of the large packing houses. It was shown that many of these concerns were dealing in wholesale groceries, meat substitutes, and many other commodities. Legal action was begun against these concerns, and a compromise was announced in which the five principal packers agreed to dispose of their holdings in public stockyards, stockyard railroads and terminals, and cold storage warehouses except where necessary for their own meat products, to dissociate themselves permanently from the retail meat business and all their so-called "unrelated" lines, and in general to confine their trade to meat and provisions.

Still another form of governmental regulation is illustrated by the standardization of containers and the market inspection service rendered by the Department of Agriculture and some of the States, particularly on fruits, vegetables, and other perishable commodities. This latter service is designed primarily to minimize disputes between shippers and consignees as to the quality of the products on receipt at their destination.

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FOOL. See Court Fool.

FOOLS, Feast of. See Feast of Fools.

FOOL'S ERRAND, A. A novel of the South in the Reconstruction period, by Albion W. Tourgée (1879).

FOOL'S PARADISE (Lat. *limbus fatuorum*). That division of *limbus* (q.v.) in which the souls of fools, idiots, and lunatics, who are not responsible for their sins nor yet deserving of heaven, await the Resurrection. As commonly used, the expression denotes a state of insecure joys or false hopes.

FOOL'S PARSLEY. An umbelliferous weed, very common in gardens and fields of Europe, and introduced into the United States from New England to Minnesota. The only species, *Æthusa cynapium*, is a poisonous plant with properties similar to those of the hemlock and resembles parsley in its manner of growth and foliage. It is frequently mistaken for parsley and is the cause of serious accidents.

FOOL'S REVENGE, The. A tragedy by Tom Taylor, produced at the Queen's Theatre, London, in 1869. It was taken bodily from Hugo's *Le roi s'amuse*.

FOOT. See Weights and Measures.

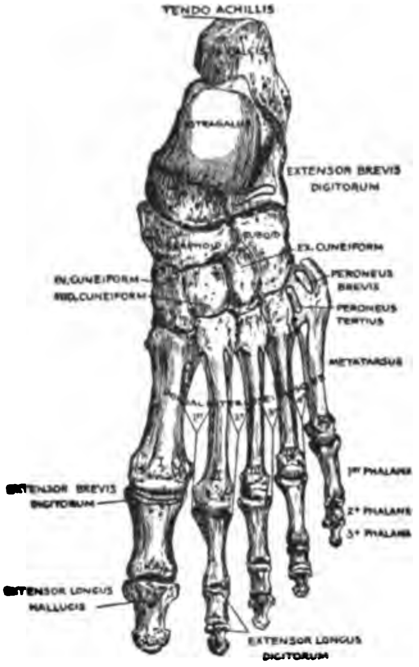
FOOT. See Organ.

FOOT. See Versification.

FOOT. In describing the structure of the foot we begin with the bones which occur in it. In man these are 26 in number and are arranged in three natural groups—viz., the tarsal bones, corresponding to the carpal bones of the hand, which are the hindermost; the metatarsal bones, which occupy the middle portion; and the phalanges of the toes anteriorly. The tarsal bones, seven in number, are short and thick and form the heel and the hinder part of the instep. The uppermost is called the *astragalus*, from its supposed resemblance to the dice used by the Romans. Above it is articulated or jointed with the two bones of the leg, the *tibia* and *fibula*, and through these bones the whole weight of the body is thrown upon the two *astragali*. Behind, it is connected with and rests upon the *os calcis*, or heel bone, which is the largest bone of the foot. Immediately in front of it is the *scaphoid* (boatlike) bone. In front of the scaphoid bone are the three *cuneiform* (wedge-shaped) bones; and on the outer side of the cuneiform bones and in front of the os calcis is the *cuboid* bone. The front row of tarsal bones is composed of the three cuneiform bones on the inner side of the foot and of the cuboid bone externally. There are five metatarsal bones passing forward, one for each toe. Each cuneiform bone is connected with one, and the cuboid bone with two, of these metatarsal bones. Behind they are close together, but as they run forward they diverge slightly from one another, and their anterior ends rest upon the ground and form the *balls* of the toes. They constitute the fore part of the instep. The remaining bones are those of the toes and are named the *phalanges*, each toe having three of these bones, excepting the great toe, which has only two.

The instep is composed of the seven tarsal and the five metatarsal bones, which are so arranged and connected as to form an arch from the extremity of the heel bone to the balls of the toes.

This is called the plantar arch, from *planta*, the sole of the foot. The astragalus forms the summit or keystone of this arch and transmits the weight which it receives posteriorly to the heel and anteriorly to the balls of the toes. The arrangement of the fibres and laminæ in the interior of the bones is such that the greater number of them in each bone follow the directions of the two pillars of the arch and thus give the greatest strength to the bones in the directions in which it is most required. There is also an arch from side to side in the foot, springing from the cuboid on the outside to the inner cuneiform on the inside. See FOOT, COMPARATIVE ANATOMY OF.



DORSAL SURFACE OF LEFT FOOT.

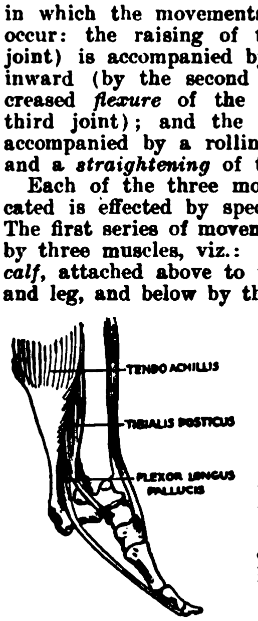
The bones, where they articulate with one another, are covered with a tolerably thick layer of highly elastic cartilage, and by this means, together with the very slight movements of which each bone is capable, a degree of elasticity is given to the foot, and consequently to the step, which would be altogether wanting if the plantar arch were composed of one single mass of bone. This elasticity is far greater in the anterior pillar of the arch, which is composed of five comparatively long bones sloping gradually to the ground, than in the posterior pillar, which is short, narrow, and composed of a single bone, which descends almost vertically from the ankle to the ground. Hence, in jumping from a height we always endeavor to alight upon the balls of the toes and thus break the shock which we should feel if by accident we descended upon the heels.

The ligaments which unite these bones to one another, and by which the movements of each bone upon the others are limited, are very numerous. Two of the most important of these may be mentioned. One, the *plantar*, or *long calcaneocuboid ligament*, of great strength, passes from the undersurface of the os calcis, near its extremity, forward to the bases of the second, third, and fourth metatarsal bones. It extends between the lowest points of the two pillars of the arch, holding them in their places, and preventing their being thrust asunder when pressure is made upon the key bone. It converts the groove on the undersurface of the cuboid bone into a canal for the passage of the tendon of the *peroneus longus* muscle. Another strong ligament passes from the under and fore part of the os calcis to the outer side of the scaphoid bone. This is the *superior calcaneoscaphoid* ligament. The *interosseus*, or *internal calcaneocuboid* ligament, directly connects the os calcis and the cuboid bones. It is blended at its origin with the *superior calcaneoscaphoid ligament;* and by separating in front they form the Y ligament. The Y ligament underlies and supports the round head of the astragalus and has to bear a great deal of the weight which is transmitted to that bone from the leg. It possesses a quality which the ligament just described, and most ligaments, have not, viz., elasticity. This is very important, for it allows the head of the key bone to descend a little when pressure is made upon it and forces it up again when the pressure is removed, and so gives very material assistance to the other provisions for preventing jars and for giving ease and elasticity to the step.

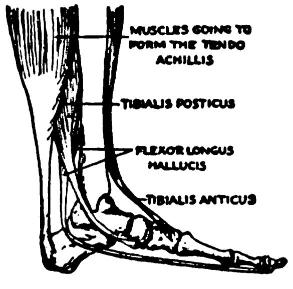
The spot over which this ligament extends is the weakest in the foot, the astragalus being there unsupported by any bones; additional support is, however, afforded when it is most required by the tendon of a strong muscle, the *posterior tibial*, which passes from the back of the tibia (the chief bone of the leg) round the inner side of the ankle, to be inserted into the lower part of the inner surface of the scaphoid bone. It not infrequently happens that the astragalus, from being either insufficiently supported or overweighted, descends slightly below its proper level, causing a lowering of the arch and a flattening of the sole of the foot. The defect, when decided, is termed "flat foot"; in extreme cases the bones may descend to such an extent as to render the inner side of the foot convex instead of concave. There are two periods of life at which flat foot is especially liable to occur: (1) in infancy, if the child be put upon its feet before the bones and ligaments, especially the latter, are strong enough to bear its weight; and (2) about the age of 14—a period at which growth is very quick, and the body consequently attains a considerable and rapid augmentation of weight. For other deformities of the foot, see CLUBFOOT.

We now come to the movements of the foot upon the leg. We see here a striking combination of variety of movement with general security. This combination is effected by the harmonious action of three joints, each of which acts in a direction different from the others. The first of these joints is the ankle joint, which is formed by the bones of the leg—the tibia and fibula—above and the astragalus below. By this joint the foot is bent or straightened on the leg. The second joint is between the astragalus and the heel bone, and it permits the foot to be rolled inward or outward; while the third joint is between the first and second rows of tarsal bones—viz., between the astragalus and heel bone behind, and the scaphoid and cuboid bones in front—and allows the degree of curvature of the plantar arch to be increased or diminished within certain limits. The following is the order in which the movements of these three joints occur: the raising of the *heel* (by the first joint) is accompanied by a rolling of the foot inward (by the second joint), and by an increased *flexure* of the plantar arch (by the third joint); and the raising of the *toes* is accompanied by a rolling of the foot outward and a *straightening* of the sole.

Each of the three movements we have indicated is effected by special groups of muscles. The first series of movements is mainly effected by three muscles, viz.: (1) *the muscles of the calf*, attached above to the bones of the thigh and leg, and below by the *tendo Achillis* to the heel bone; (2) the *posterior tibial*, attached above to the tibia, and below by its tendon to the scaphoid bone; and (3) the *peroneus brevis*, attached above to the fibula, and below by its tendon to the outer metatarsal bone. The calf muscles, whose tendon is inserted into the heel bone, are large and very powerful, for in raising the heel they have to raise the weight of the body. The other two muscles, the posterior tibial and the short peroneal, turn round the inner and outer ankle respectively, and are inserted into the inner and the outer edges of the instep—the former being attached to the scaphoid, and the latter to the outer metatarsal bone. They not only assist in raising the ankle, but support it laterally. The muscle whose tendon is on the inner side of the foot (the posterior tibial) effects the two movements which are associated with the raising of the heel bone, viz., the turning of the foot inward and the increased flexure of the arch. The second series of movements—the raising of the toes, the turning of the foot outward, and the straightening of the sole—are effected by two muscles, the *anterior tibial* and the *third peroneus*, whose tendons pass, one in front of the inner ankle, and the other in front of the outer ankle, to the corresponding edges of the instep, and are inserted into the internal cuneiform and the outer metatarsal bones. The muscles are direct flexors of the tarsus upon the leg, the former raising the inner and the latter the outer border of the foot.



EFFECT OF MUSCULAR ACTION IN THROWING UP THE ARCH.



ARCH OF THE FOOT IN ORDINARY STANDING POSITION.

Another point in the anatomy of the foot that requires notice is the mode of union of the metatarsal with the tarsal bones. In these joints in the fourth and fifth toes a slight revolving motion can take place, which probably enables the outer metatarsals to adapt themselves to inequalities of the ground, and to equalize the distribution of the weight which is thrown upon the foot; while in the corresponding joints of the three inner toes scarcely any motion can occur—a provision by which additional strength is given to the inner side of the foot, upon which the weight of the body most directly falls.

The skin of the sole is very tough and strong; and intervening between it and the bones and long plantar ligament is a thick pad of fat, which acts the part of an air or water cushion in defending the adjacent parts from injurious pressure and in deadening the jars and shocks that would otherwise be felt in leaping, etc.

Consult Gray, *Anatomy* (Philadelphia, 1913), and Nutt, *Diseases and Deformities of the Foot* (New York, 1913).

FOOT, COMPARATIVE ANATOMY OF THE. As locomotor appendages, so called, feet occur in echinoderms, mollusks, and arthropods among invertebrates, but they are not in any way homologous with the feet of the higher vertebrates. Among echinoderms the name "foot" is given to any appendage of the ambulacral system which terminates in a sucker, and in the case of starfishes it is extended to any of the appendages lying in the ambulacral groove. These echinoderm feet are often, but by no means always, used for locomotion. Mollusks possess a very muscular and usually largely developed organ, primarily concerned with locomotion, known as the foot; it is flat or concave in the chitons and gastropods and covers the ventral side of the body; in lamellibranchs it is also ventral in position, but is wedge-shaped and laterally compressed; in cephalopods it is anterior in position, surrounding the mouth, and is divided up into a siphon, placed posteriorly, and a number of outgrowths known as tentacles or arms. Among cephalopods the chief function of the arms is for capturing prey, locomotion being provided for in other ways, chiefly by means of the siphon, which is formed by the union of two epipodial folds. The "feet" of arthropods show a very great variety of form, due chiefly to the variety of functions which they perform. In most cases it is practically impossible to distinguish between leg and foot, the latter consisting merely of the terminal joint or joints of the former. In many insects, however, the terminal part of the leg is so placed, with reference to the other joints, when in use, that it has both the appearance and function of a foot.

Amphibians and Reptiles. Passing over the nonhomologous fins of fishes, we may first mention the foot of the Urodela, the short-legged amphibians. As in all vertebrates, the feet here are the termination of the hind limbs, and their skeleton consists of two or three parts, according to whether we include the ankle bones or not. Most distal of all are the phalanges of the digits or toes, then follow the metatarsals, and most proximal are the tarsals. In the Urodela the feet are supplied with five digits in most cases, but some have only four, and *Proteus* has only two; the digits lack nails or claws; the number of phalanges differs in the various digits as well as in various species. The metatarsals are of the same number as the toes and appear like their proximal joint. The tarsals are a group of nine bones, of which one, the centrale, occupies a middle position; distal to it are five others of approximately uniform size, called tarsales; proximal to the centrale are three bones, of which the inner is the tibiale, the outer the fibulare, and the middle one the intermedium. In the Anura (frogs, toads, etc.) the foot is very much larger, and the toes, five with no nails, are broadly webbed; phalanges and metatarsals are greatly elongated, as are also two of the tarsal bones, which are known as the astragalus and the calcaneum; the former is the tibiale, with which the intermedium has fused, while the latter is the fibulare. The Chelonia (turtles, etc.) have five digits, but in the marine forms the toes are more or less firmly united together by the integument, thus forming paddles useful in swimming. Some or all of the digits of Chelonia bear nails or claws. The phalanges and metatarsals are stout and short, except in the marine forms, where they are elongated and flattened. The fifth metatarsal has the appearance of being bent in the middle. The tarsal bones undergo various fusions, so that their number and arrangement differ in different genera. The tibiale and intermedium are generally united into an astragalus, which in some cases includes the centrale also, and in one genus (*Emys*) even the fibulare, thus making a single bone of the whole proximal series. The two outer tarsals are fused to form the cuboid. Lizards usually have five digits, two, three, four, five, with four phalanges respectively, beginning at the inner side; the fifth metatarsal is bent as in the turtles, and is perhaps fused with the fifth tarsale, in which case the ankle joint would come in part between the two rows of tarsal bones, which is the condition of the ankle in birds. In lizards we find an astragalus and calcaneum proximally and a cuboid distally, with sometimes one or two more of the tarsales. Feet are entirely lacking in snakes, unless the spur on each side of the body near the vent in the boas and pythons be regarded as such. Crocodiles have only four toes, though an examination of the skeleton reveals a rudimentary fifth metatarsal; the four digits have respectively two, three, four, and four phalanges, and only the first three have claws. Only four tarsal bones are present, of which the two distal ones are small, while the two proximal, called astragalus and calcaneum, are large; the latter bears a prominent calcaneal process projecting posteriorly, which forms a heel to the foot—the first occurrence of such a thing in the animal kingdom.

Birds. Among birds the feet are so profoundly modified by the various uses to which they are put that we find a very great variety of external form, but the skeletal structure shows considerable uniformity. The number of digits is usually four, not rarely three, and in the ostrich only two; the fifth toe is the one always missing, the first occasionally, and in the ostrich the second also; the phalanges are almost always two, three, four, and five, or rarely, two, three, four, and three, or in swifts, two, three, three, and three. The metatarsals are more or less completely fused into a single bone, the upper end of which is fully fused with the distal row of tarsal bones. The proximal tarsal bones are fused with the lower end of the tibia, so that the ankle joint is actually between the two series of tarsal bones. In the foot of a bird, therefore, what is usually termed the "heel" is simply the base of the digits; the so-called "tarsus" (see Bird) is really a tarsometatarsus, and the "tibia" is a tibiotarsus. The foot of a bird is usually free from feathers and is generally covered with scales, and the digits terminate in straight or more or less hooked claws. In some birds, however, especially among the grouse and the birds of prey, the feet are feathered (at least in front) to the base of the toes, and in ptarmigans even to the claws.

Mammals. Among mammals there is perhaps even greater variety in the form and structure of the foot than among birds, but the foot of mammals is usually very similar to the hand, except in the highest forms. In the orders Sirenia and Cetacea there is no foot whatever, and among the aquatic Carnivora (seals, etc.) it is modified to form a sort of flipper of great use in swimming; this is accomplished by the lengthening of the first and fifth digits, the great reduction of the heel, and the greater or less union of the leg with the tail and posterior part of the body. The number of functional digits in mammals varies from one to five, but frequently, where the number is below five, rudimentary digits are present. The digits terminate either in claws, nails, or hoofs, according to the habits of the animal; the number of phalanges is remarkably constant—in the first digit two, and three in each of the remaining four. In the Ungulata the metatarsals are often fused to form a long tubular bone, the "cannon bone." The tarsus of mammals contains from six to eight bones, according to the amount of fusion; the intermedium is distinct only in marsupials, in the Monodelphia being fused with the tibiale to form the astragalus; the fourth and fifth tarsales fuse into a single bone known as the cuboid; the centrale is called the navicular, and the calcaneum is called the pisiform bone; the other tarsales are known as cuneiform bones, and the inner and second one sometimes fuse to form a single bone. Lack of space forbids any discussion of the general appearance of the feet and their special uses in mammals, but it may be remarked that if the whole sole of the foot is applied to the ground the animal is called "plantigrade," like man; if only the toes form the supporting portion of the foot, the animal is "digitigrade"; and if only the distal phalanx serves for support (as in the horse), the creature is "unguligrade."

FOOT, Katherine (1852–). An American zoölogist. She was born at Geneva, N. Y., and was educated privately. She became known for her work in cytology, her special field being the spermatogenesis and oögenesis of Hemiptera and the maturation and fertilization of the egg of *Allolobophora fetida*.

FOOT, Solomon (1802–66). An American lawyer and legislator. He was born in Cornwall, Vt., graduated at Middlebury College in 1826, and was professor of natural philosophy in the Vermont Academy of Medicine from 1828 to 1831, when he was admitted to the bar. After 1833 he served several terms in the State Legislature, for three years (1836, 1838, and 1847) as Speaker of the House; and he was one of the Representatives of his State in Congress from 1843 to 1847, and from 1851 until his death was a member of the United States Senate, serving as president pro tempore in 1861–63. At first a Whig, he joined the Republican party at the time of its formation in 1856.

FOOTA-JALLON, fo͞o'tȧ'zhȧ'lôɴ'. See Futa-Jallon.

FOOT-AND-MOUTH DISEASE, or Aphthous Fever. A virulent infectious disease, characterized clinically by a condition of fever followed by eruptions on the integument especially of the mouth and feet. Since the middle of the eighteenth century outbreaks of an epizoötic form have been frequently recorded among cattle, which, like pigs, are especially subject to it. It also occurs in sheep, goats, and other even-toed ungulates. Man is frequently affected. In European countries, where the disease usually prevails and causes great losses, the outbreaks have usually spread from Asia. Africa has also been visited. The United States has been visited by several outbreaks, all of which have been promptly eradicated by the National Department of Agriculture in coöperation with the States in which the outbreaks have occurred.

The disease may appear under a mild or a grave form. In the mild form symptoms of fever and general lassitude are observed. Bladder-like eruptions appear, especially on the mucous membrane of the mouth, between the hoofs, and on the mammary gland. The last-named location is most frequently attacked during the secretory condition of the gland. Mammitis is a frequent complication of the disease. The mortality from this form of the disease in cattle is usually from 2 to 50 for each 1000 cases. In the grave form of the disease eruptions occur on internal mucous surfaces of the digestive or respiratory tract. The symptoms in such cases are those of acute bronchitis, pneumonia, or enteritis, according to the part which is affected. The mortality in this form varies from 15 to 20 per cent. In sheep the eruptions on the feet are usually more serious and persist for a longer time. In sucking lambs the disease assumes the intestinal form and is especially fatal. The disease spreads rapidly among animals confined in the same stable. Infection may be produced by the eruptions on the feet. Infected water is another common means of dissemination. The virus of the disease may gain entrance to the organism through the uninjured mucous membranes of the mouth, respiratory passages, or the alimentary tract. The pathogenic organism of this disease has recently been isolated and termed *Cytoryctes aphtharum*. The period of incubation after infection by natural methods is from two to six days. The virus is readily destroyed by desiccation or by exposure to air and sunlight. It possesses a weak resisting power to antiseptics such as carbolic acid and formaldehyde. Inoculation with serum from animals which have recovered from the disease does not confer immunity. Attempts to work out a method of immunization which would be sufficiently effective and at the same time without danger have so far given only partially satisfactory results. No medicament has been found to have a specific action on the development of the disease. The mucous surfaces upon which eruptions occur may be washed with antiseptic solutions, and other symptoms may be combated as they appear. The chief reliance should be placed on proper sanitary measures. Diseased animals should be immediately shot and buried or burned, and infected stables should be thoroughly disinfected. In Europe, and other periodically visited countries, however, such drastic measures cannot be resorted to.

The meat of aphthous animals is not considered dangerous as food for man. The milk of such animals is, however, highly infectious. The disease may also be contracted from eating infected butter and cheese.

Consult: Hutyra and Marek, *Special Pathology and Therapeutics of the Diseases of Domestic Animals*, vol. i (Chicago, 1912); E. W. Hoare, *A System of Veterinary Medicine*, vol. i (Chicago, 1913); Murray, and others, "Special Report on Diseases of Cattle," in *United States Department of Agriculture, Bureau of Animal Industry* (Washington, 1912); Salmon and Smith, "Foot-and-Mouth Disease," in *United States Department of Agriculture, Bureau of Animal Industry, Circular 141* (1902); Mohler and Rosenau, "The Origin of the Recent Outbreak of Foot-and-Mouth Disease in the United States," in *United States Department of Agriculture, Bureau of Animal Industry, Circular 147* (1909); A. D. Melvin, "The 1908 Outbreak of Foot-and-Mouth Disease in the United States," *Bureau of Animal Industry, Report* (1908).

FOOTA TORO, fōō'tȧ tō'rō. See Futa Toro.

FOOTBALL. An outdoor game played by opposing teams with an inflated ball, the principal object on the part of one team being to force the ball across the goal of the other. Football—or, as it was called in early English times, camp ball, camping, or hurling—is a sport of great antiquity. The ancient Greeks played a form of the game which they called *harpaston*. The Romans played a similar game which they called by its Grecian name, slightly Latinized into *harpastum*. Julius Pollux, writing at Rome in the second century, describes the Roman game as follows: "The players divide themselves into two bands. The ball is placed upon a line between them. At the two ends of the field, behind the line upon which the players are stationed, are two other lines beyond which these two bands strive to carry the ball." Varieties of the game have also been found in many other parts of the ancient world. The first travelers to the Polynesian Islands found the natives playing with a football made of fibres of bamboo. The Eskimo also played with a ball made from leather filled with moss. During the Middle Ages it flourished in Italy under the name of *calcio*. The principal home of football play, however, has been the British Isles. William Fitzstephen, in his *Vita Sancti Thomæ*, written about 1175, graphically described the assembling of the lads of London, "their parents and the rich and wealthy, in the fields of the suburbs after dinner, to enjoy the famous game of football." So popular did the sport become in the ensuing centuries that king after king issued proclamations against it in order to protect the warlike pastime of archery. Edward II in 1314 forbade football "on pain of imprisonment to be played in the future," and almost 100 years after we find Henry VI proclaiming that "na man shall play at the fut ball." Notwithstanding these and other repressive laws, football flourished prodigiously in England. At times town would challenge town, or parish would be arrayed against parish. Such games were played over vast areas, sometimes miles in extent, and were participated in by several hundred players. There also were in this period games between small bodies of men, playing according to crude but orderly rules. English literature from Chaucer to Shakespeare abounds in allusions to the sport. By 1800 football in England had evolved into several highly specialized types of games which were played respectively at Charterhouse, Eton, Harrow, Rugby, Westminster, and in the other great secondary schools. All these games were characterized by a prohibition against carrying the ball. The introduction of the carrying feature into football is attributed upon a memorial tablet at

Rugby to a schoolboy named William Webb Ellis, who in the closing minute of a drawn game in the autumn of 1823, "with a fine disregard for the rules of football as played in his time, first took the ball in his arms and ran with it, thus originating the distinctive feature of the Rugby game." In the 40 years that followed many clubs sprang up throughout England, some playing the kicking and others the carrying game, but all handicapped by a lack of uniform rules. In 1863 a conference was held by the football men at Cambridge University, and a code drafted for recreative purposes at Cambridge. Later in this same year (Dec. 1, 1863), a convention was held in London by the football clubs of the city, at which was organized the London Football Association, which adopted substantially the Cambridge rules. These rules forbade carrying the ball. Hence the type of game established by the London Football Association has since been known as the "Association" game. The names "soccer" and "socker" by which it also is known are merely humorous derivatives of the word "Association." Similarly, on Jan. 26, 1871, another convention was held in London of clubs playing the carrying style of game. This second convention resulted in the organization of the Rugby Football Union, and the adoption of the rules of Rugby School as the playing code.

This game is sometimes humorously known as "Rugger." These two great football organizations still exist and still exercise control over their respective games in England, other parts of the world accepting their jurisdiction. During the year 1913 not less than 400 professional clubs and 15,000 amateur clubs in the United Kingdom played Association football under allegiance to the Football Association. The number of professional players in the Association ranks approximated 5000 and the number of amateur players 300,000. In England alone 8000 matches of Association football were played every week for eight months in the year. The international match between England and Scotland, played at Glasgow, March 23, 1913, attracted 127,307 spectators. The growth of Association football throughout the world has been one of the most amazing features of all sport in recent years. This style of play has gained a strong foothold in all of the countries of Europe, North and South America, and in Australia and South Africa. Each country has its national organization, and La Fédération Internationale de Football Association, formed at Paris, May 21, 1904, exercises a world-wide supervision of the Association game. Rugby football in England has remained almost strictly an amateur sport and is incomparable in public interest with the Association game or with intercollegiate Rugby football in America.

The earliest mention of football in America is to be found in the *Relation of Virginia* by Henry Spellman, published about 1609. Describing the sports of the Colony, he says: "The vse beside football play which women and young men much doe play at. They make their gooles like ours only they never fighte nor pull another doone. The men play with a littel ball lettinge it fall out of their hands and striketh with the top of their foote. He that can strike the ball farthest winnes that whch they play for." Random play with an inflated bladder upon village greens and country fields was a common sport of boys in America in early times. About 1840 football as a crude game made its appearance at Harvard, Princeton, and Yale. At Harvard and Yale it took the form of a rush between the two lower classes—a sport which became so rough that the faculties at each institution prohibited football in 1862. At Princeton the sport evolved into a simple but orderly game under original rules which partly resemble Association football of to-day. By 1865 this game had developed into a well-balanced system of play. During these same years a similar game was evolving at the neighboring college, Rutgers. As a result, these two institutions met in a match game (Nov. 6, 1869). This was the first intercollegiate contest in America and also antedates the first intercollegiate game in England, Cambridge *versus* Oxford (Feb. 10, 1872). During the next two years Columbia, Princeton, and Rutgers played regular schedules of games. Yale appeared as an intercollegiate competitor in 1872, and Harvard in 1874. Two years later (Nov. 26, 1876) Columbia, Harvard, Princeton, and Yale held a convention at which the American Intercollegiate Football Association was formed, and the Rugby Union rules with a few changes were adopted as the common playing code. That association lasted until 1894, during which time nearly all of the colleges of the country and most of the schools adopted the intercollegiate game.

In 1894 the Intercollegiate Association disintegrated and was followed by an association of Harvard, Pennsylvania, Princeton, and Yale as a rules committee to preserve the game. This rules committee subsequently extended its membership to include Chicago, Cornell, and the Naval Academy. In 1905 an independent association of colleges was formed which also appointed a rules committee. These two rules committees immediately coalesced and assumed control of the game, their legislation now being accepted by the schools and colleges of the country. Since the adoption of the Rugby Union rules as the intercollegiate code in 1876, this game has been in a continual state of change. Although its basic character remains Rugbian, so many original features have been introduced that it presents a distinct type of game. In 1913 the intercollegiate game was played by 400 colleges and 5000 schools. Approximately 162,000 players participated, 21,600 games were played, and 6,480,000 spectators attended. The largest attendance was that of the Army-Navy game in New York, Nov. 29, 1913, estimated at 51,000 persons.

Association Game. This game is characterized by a few simple but highly ingenious rules. It is played upon a field the maximum length of which is 130 yards, minimum 100 yards, and whose maximum width is 100 yards, minimum width 50 yards, marked with end lines (known as goal lines), side lines (known as touch lines), a halfway line, a goal area, and a penalty radius.

The ball is spherical, not less than 27 inches in circumference nor more than 28 inches. The goals are marked by posts set in the middle of the goal line, 8 yards apart, connected by a crossbar 8 feet from the ground. To score a goal the ball must pass between the posts, underneath the crossbar. The game is played by 11 men upon each side, the names of their positions and their formal stations being as follows: five forwards, known as outside left, inside left, centre, inside right, and outside right, who deploy at equal intervals along the halfway line; a goal keeper who stands upon or near the goal line; between the halfway line and the goal line at equal distances therefrom and from one another are two lines of backs, consisting of three half backs and two full backs, arrayed upon their respective lines at equal distances from one another. The players preserve as closely as possible these relative positions to one another throughout the game, but vary in the distances according to the course of the ball. Prior to the game the two captains toss a coin. The winner of the toss has the option of a choice of goals or the kick-off. The length of a game is 90 minutes, divided into two halves of 45 minutes each, with an interval of one minute at half time, during which the opposing teams exchange goals.

The game begins with a place kick from the centre of the field. Thereafter the ball is driven by kicks, no player being permitted to handle the ball except the goal keepers, each of whom within his own penalty radius may pick up the ball and carry it, but not more than two steps. In kicking the ball long kicks are employed and a short kick known as a "dribble," by which a player while running "nurses" the ball ahead of him. If the ball is forced across the touch line, a player of the side which did not force it out throws the ball in; if it is kicked across the opponents' goal line, it is kicked off by a player of the other side from within his opponents' goal area; if a player kick the ball across his own goal line, the opponent may kick it into play from a point within one yard of the nearest corner, known as a "corner kick." A corner kick, however, may not directly score a goal. When a player is kicking the ball, any player of the same side who is nearer the opponents' goal line may not play the ball, nor interfere with an opponent, because he is what technically is termed "off-side." He does not become "on-side" until three players of the opposing side have come between him and his opponents' goal. Players are forbidden to trip each other, or to use their hands to hold or to push an opponent. They may block their opponents with their bodies, but may not charge into them from behind except when intentionally blocked by them.

Rugby Game. The Rugby game is played upon a field not exceeding 110 yards in length and not more than 75 yards in width, upon which are marked goal lines, touch lines, five-yard lines, twenty-five-yard lines, halfway line, and dead-ball lines. In the middle of each goal line two posts are placed, 11 feet high and 18 feet, 6 inches apart, connected by a crossbar 10 feet from the ground. The ball is oval in shape, its exact size and weight being regulated by rule. Fifteen players constitute a side, usually divided into eight forwards, two half backs, four three-quarter backs and one full back. Unless otherwise agreed, a game lasts 80 minutes, divided into two halves of 40 minutes. The captains prior to the game toss a coin for choice of in-goals or kick-off. Play begins with a place kick from the centre of the field, known as the kick-off. Thereafter the ball generally is put in play by a scrummage. A scrummage is formed by one or more, usually the 16 forwards, packing closely around the ball, which has been placed upon the ground and which none of the players may touch with their hands. Each pack strives to force the ball out towards its own goal, so that some one of its backs may get it and run with it. Two methods have developed for obtaining the ball out of a scrummage, "wheeling" and "heeling." In "wheeling" the ball is secured under the foot of a player and nursed to the right or to the left, when a wheel suddenly is made upon the more favorable side by the back row bringing the ball around to the front. In "heeling" possession of the ball is obtained by "hooking" it in the front row of one of the packs and then suddenly forcing the ball out behind with the heel. When the ball comes out of scrummage, it may be kicked, picked up, and run with by any player who is not "off-side." A player is "off-side" if the ball has been touched by one of his own players who is behind him. Such an "off-side" player becomes "on-side" as soon as an opponent has touched the ball, or a player of his own side has run in front of him with the ball. Players when "off-side" may not interfere with an opponent. A player who is carrying the ball forward is stopped by opponents by what is known as a "tackle." A tackle is the seizing by one or more players of the opponent carrying the ball so that he cannot at any moment while so held pass or play it. If a player catches the ball while in flight from a kick or throw by an opponent and at the same time makes a mark with his foot at the spot of the catch, such a catch is a "fair catch" and entitles the catcher's side to a "free kick" with the ball. A match is won by the side scoring a majority of points. If a player puts his hand upon the ball while it is on the ground in his opponents' in-goal, a "try" is scored which counts three points and entitles the side scoring them to a free kick at the goal. The ball is brought out upon the field of play and placed by a player for the kicker to kick. If he kicks the ball between the posts and over the bar, a "goal from a try" is scored and counts five points, in which case the three points from the try are not counted. If a player during play drops the ball from his hands and kicks it, upon the rebound, between the posts and over the bar, a "dropped goal" is scored, which counts four points. If a goal is kicked by a place kick or a drop kick from a free kick following a fair catch, a "goal from a mark" is scored and counts three points. If such a free kick follows the imposition of a penalty, a "goal from a penalty kick" is scored and counts three points.

American Intercollegiate Game. This game is by far the most intricate and elaborate of the various games. It is played upon a rectangular field, 360 feet long, 160 feet wide, divided into a field of play, 300 feet long and 160 feet wide, and into two end zones, each 30 feet long and 160 feet wide. The field of play is divided into five-yard intervals, marked with white lines, which gives it the familiar name of "gridiron." Goal posts, 20 feet high, 18 feet 6 inches apart, connected by a crossbar 10 feet from the ground, are set in the middle of each goal line. The ball is oval in shape. The teams consist of 11 players upon a side, divided into forwards and backs. The forwards, seven in number, comprise the rush line and are left and right end, left and right tackle, left and right guard, and centre. The back field contains a quarter back, two half backs, and a full back. The length of a game is 60 minutes, divided into four quarters of 15 minutes each. Between the first and second quarters and between the third and four quarters occurs an interval of one minute, during which the teams exchange goals. Between the second and third quarters occurs an intermission of 15 minutes, during which the two teams leave the field to rest.

The two captains having decided the choice of goals and kick-off by tossing a coin, play begins with a kick-off from the kicker's 40-yard line. There are three methods of advancing the ball—rushing, forward passing, and kicking. Rushing is carrying the ball forward in the arms. Ordinarily the ball is put in play by a scrimmage. The two rush lines face each other in two lines. One side receives possession of the ball. A player places the ball upon the ground and "snaps" it into play by sweeping it backward between his legs into the hands of a back, who may carry it forward or pass it to an associate to carry it forward. A team upon obtaining possession of the ball is allowed four attempts called "downs" to advance the ball a distance of 10 yards. If this distance is gained, the ensuing down becomes a first down; if a team fails to gain the distance, the ball must be surrendered to the other side. On account of this orderly possession of the ball each team attempts to advance it by an elaborate system of tactical formations and manœuvres, known as "plays," which have been planned and practiced in advance and which are controlled by a secret numerical system of signals.

Passing the ball forward consists of throwing the ball forward to a comrade. This form of attack is hedged with technicalities. The ball must be passed from a point at least five yards behind the line of scrimmage; it may be caught only by the players upon the ends of the line, or by backs who were one yard behind the line when the ball was put in play, and the ball may not touch the ground before being caught. When a team perceives that it will not make the necessary 10 yards in its four downs, the practice is not to attempt to rush the ball on the last down, but to kick it so as to place it as far away from their goal as possible. Fair catches and free kicks, off-side and on-side play, with slight variation in technical details, exist in the Intercollegiate game as in the Rugby game. The game is awarded to the team scoring the most points. If a player lawfully carries or obtains the ball across his opponents' goal line, a touchdown is scored which counts six points and entitles the team scoring the same to a try at goal by a place kick, which, if successful, counts an additional point. A goal from the field by a drop kick or by a place kick counts three points. Either may be kicked during regular play or may be kicked from a free kick following a fair catch. If a player of the side in possession of the ball is forced to touch the ball to the ground behind his own goal, provided a player of his side caused the ball to cross his goal line, a safety is scored which counts two points for the opponents.

Gaelic Football is a very old Irish game which has been revived in recent years. It is played by teams of from 14 to 21 players, although the common number is 15. Besides the usual goal posts there are outer-point posts which give added opportunities for scoring. The teams line up for play in two parallel lines, the opponents holding hands. The ball then is thrown into the centre of the line, and the game begins. Having caught the ball, a player may advance it by kicking or striking with the hand, but he may not throw or carry it. A resulting method of play is that of "hopping," by which the ball is kept bounding between the hand and the ground, while the player rapidly advances down the field.

Consult Shearman, "Athletics and Football," *Badminton Library* (London, 1887); Marshall, *Football, The Rugby Union Game* (ib., 1892); Shearman, *Football, The Association Game* (ib., 1901); Camp, *Book of Football* (New York, 1910); Davis, *Football, The American Intercollegiate Game* (ib., 1911); Warner, *Football for Players and Coaches* (Carlisle, Pa., 1912); Reed, *Football for Public and Spectator* (New York, 1913); "Official Intercollegiate Football Guide," "Official Soccer Football Guide," "Official Rugby Football Guide," *Spalding's Athletic Library* (New York, annually).

FOOTE, Allen Ripley (1842–). An American economist, born at Olcott, Niagara Co., N. Y. He was educated in the public schools and served in the Civil War, was editor of *Public Policy* from 1899 to 1905, became president of the National Tax Association upon its organization in 1907, and president of the Ohio State Board of Commerce in 1909, after eight years' service as commissioner. He identified himself actively with various leading economic and social science organizations and published: *Economic Value of Electric Light and Power* (1899); *Municipal Public Service Industries* (1899); *Constitutional Municipal Government* (1900); *Public Policy Editorials* (3 vols., 1901–03); *Employers and Employes* (1902); *Labor, Capital, and the Public* (1905); *Regulation of Public Utilities* (1911); *Compensation for Industrial Injuries* (1913).

FOOTE, Andrew Hull (1806–63). A distinguished officer of the United States navy. He was born in New Haven, Conn., on Sept. 12, 1806, the son of Samuel A. Foote (q.v.); studied at West Point for several months, and became acting midshipman in the navy on Dec. 4, 1822. He was commissioned lieutenant on May 27, 1830; from 1837 to 1840 was executive officer of the *John Adams*, of the East India squadron, during its cruise around the world, and from 1841 to 1843 was stationed at the Naval Asylum in Philadelphia, of which during the last two years he was in full charge. He was executive officer of the Boston Navy Yard from June, 1846, to June, 1848, and from 1849 to 1851, as commander of the brig *Perry*—his first independent command—cruised along the African coast for the purpose of protecting American commerce and suppressing the slave trade. In December, 1852, he was promoted to the rank of commander. After four years of shore duty he was appointed to the *Portsmouth*, April 5, 1856, and was ordered to join Commodore Armstrong's fleet on the East India Station. On arriving at Canton he established fortified posts on shore for the protection of American residents; but Commodore Armstrong soon afterward ordered that the American marines be withdrawn, and while Foote was making arrangements to this end he was fired on from the so-called Barrier Forts (q.v.), which he stormed and captured a week later, acting under Armstrong's orders. Soon after his return—in October, 1858—he was appointed commandant of the Brooklyn Navy Yard, which position he relinquished, with the rank of captain, in August, 1861, soon after the beginning of the Civil War, to accept the command of the naval operations in southwestern waters. On Sept. 6, 1861, he assumed command at St. Louis and for some time devoted himself with great energy to the task of preparing his flotilla for action. On Feb. 6, 1862, he captured Fort Henry, and on the 14th he attacked Fort Donelson, before which Grant with his army had arrived two days earlier; but the attack was repulsed and Foote was wounded. (See FORT HENRY AND FORT DONELSON.) Island No. 10 (q.v.), after a siege by Foote and the forces under Pope, surrendered on April 7. On May 9, his wound having become serious, Foote left the command of the fleet in the hands of Capt. Charles H. Davis, and on July 17, 1862, at his own request, was formally detached from the Western flotilla. He had become a flag officer in November, 1861, and on July 16 was promoted to be a rear admiral. For several months in 1862–63 he was chief of the Bureau of Equipment and Recruiting, and on June 4, 1863, was appointed to succeed Rear Admiral Dupont as commander of the fleet off Charleston, but died at New York, on June 26, while on his way to assume the duties of his new position. Foote published a book entitled *Africa and the American Flag* (1854), based largely on his African cruise of 1849–51. Consult Hoppin, *Life of Rear-Admiral Andrew Hull Foote* (New York, 1874).

FOOTE, ARTHUR (1853–). An American composer, born at Salem, Mass. He studied piano and harmony with Stephen A. Emery and subsequently at Harvard University (class of 1874) with John K. Paine, continuing for a year after graduation. On leaving college he studied piano and organ playing with B. J. Lang and shortly afterward settled in Boston. From 1878 to 1910 he was organist of the First Unitarian Church of Boston. His compositions include works for orchestra (*Serenade* in E major for strings; overture, *In the Mountains;* prologue, *Francesca da Rimini;* two suites, in D minor and E); chamber music; chorus and orchestra (*Wreck of the Hesperus; Skeleton in Armor; Farewell to Hiawatha*); much church music, organ and piano pieces; and about 60 songs. Foote's work has been rather more along classical lines than in the romantic school, but a tendency towards the latter showed itself in his later compositions.

FOOTE, HENRY STUART (1800–80). An American politician, born in Fauquier Co., Va. He graduated at Washington College (now Washington and Lee University), Lexington, Va., in 1819, and, after being admitted to the bar in 1822, removed in 1824 to Tuscumbia, Ala., where he practiced law and edited a Democratic newspaper. Two years later he removed to Natchez, and soon afterward to Vicksburg, Miss., where he established the weekly *Mississippian*, favored the election of judges, and became a leader of the Democratic party, allying himself at first with the extreme States Rights branch and being elected to the Lower House of the State Legislature in 1839. In 1847 after a sharp contest he was elected to the United States Senate. He favored the annexation of Cuba, Yucatan, and Mexico, declaring that only thus could the continued possession of California and Oregon by the United States be assured. He was the author of the proposal for a grand committee of 13, which, after Webster had spoken in its favor, was accepted. It was this committee with Clay as its chairman that drew up the famous compromise measures. Later he introduced the "finality resolutions," by which the compromise laws were declared to be a "final settlement of all controversies growing out of slavery." After supporting the Compromise of 1850, which was opposed by all the other Mississippi representatives, he publicly defended himself at home and formed a Unionist party in the State. In 1852 he resigned his seat in the Senate to enter the contest for Governor of Mississippi as the Unionist candidate against John A. Quitman, Secessionist. Quitman, soon realizing that there was no chance of his own election, withdrew in favor of Jefferson Davis, who resigned from the Senate as Foote had done, but was defeated. On the conclusion of his term as Governor, Foote removed to California, but returned to Mississippi in 1858, practiced law in Vicksburg, and again entered the fight against the secession movement, participating in the Southern Convention at Knoxville, Tenn., in 1859, as one of the strongest opponents of disunion. He settled in Nashville, Tenn., when secession sentiment became too strong in Mississippi. But he cast in his lot with the Confederacy upon the secession of Tennessee and was chosen a member of the first and second Confederate congresses. His attacks on Jefferson Davis, his old rival, were bitter. Foote was in Washington even before Lee's surrender and after the restoration of peace practiced law there. His counsel was sought by the Northern leaders in regard to reconstruction matters. He became a strong supporter of Grant, whose Southern policy he favored, and by whom he was made director of the United States Mint at New Orleans, which position he held until shortly before his death. He published: *Texas and the Texans* (1841); *History of the Southern Struggle* (1846); *History of the Civil War; or, Scylla and Charybdis* (1867); *Casket of Reminiscences* (1874); *Bench and Bar of the South and Southwest* (1876).

FOOTE, MARY HALLOCK (1847–). An American artist and novelist, born in Milton, N. Y. She studied art in New York and in 1876 married Arthur D. Foote, a mining engineer. Thereafter she lived in California, Colorado, and Idaho, which have given themes for her novels and drawings. She also furnished elaborate illustrations for Longfellow's "Skeleton in Armor" and "The Hanging of the Crane." Representative of her fiction are: *The Led Horse Claim* (1883); *John Bowdoin's Testimony* (1886); *The Last Assembly Ball* (1889); *The Chosen Valley* (1892); *Cœur d'Alène* (1894); *In Exile* (1894); *The Cup of Trembling* (1895); *The Royal Americans* (1910); *Picked Company* (1912).

FOOTE, SAMUEL (1720–1777). An English actor and playwright, born at Truro in Cornwall. In 1737 he entered Worcester College, Oxford, but left without a degree and proceeded to the Temple. His fortune soon dissipated at the London coffeehouses, he turned to the stage for a means of support (1744). In 1747, with a piece entitled *Diversions of the Morning*, he opened the Haymarket Theatre, where he was at once director, actor, and dramatic author. In this and other pieces he introduced well-known living characters and by his admirable powers of mimicry succeeded in drawing large audiences, till the theatre was closed by order of the magistrates. He, however, managed to continue his dramatic performances by calling them "teas." These teas closed in 1753, and Foote returned to the regular stage, writing and adapting many plays and acting in many parts, in London, Dublin, and Edinburgh. In 1766 he broke his leg by a fall from his horse, and amputation was found necessary. Full of resources, he turned the incident to account on the stage, composing plays, e.g., *The Lame Lover* and *The Devil on Two Sticks*, expressly adapted to his own state. He died Oct. 21, 1777. Among his plays are *The Minor*, *The Liar*, and *The Mayor of Garratt*. Foote had a great reputation as a wit. His *Works*, including a memoir of him, were edited by John Bee (Badcock) (London, 1830). Consult: Cook, *Memoirs of Samuel Foote, with a Collection of his Bons Mots* (London, 1805); Davies, *Life of Garrick* (ib., 1780); Forster, *Historical and Biographical Essays* (2 vols., ib., 1860); Dibdin, *Annals of the Edinburgh Stage* (ib., 1888); Fitzgerald, *Samuel Foote* (ib., 1910).

FOOTE, SAMUEL AUGUSTUS (1780–1846). An American politician, born in Cheshire, Conn. He graduated at Yale in 1797 and was a merchant. After serving for some time in the State Legislature and twice being Speaker of the House, he was a Whig member of Congress in 1819–21 and 1823–25, of the Senate in 1827–33, and again of Congress in 1833–34. He was Governor of Connecticut in 1834–36. He was the author of "Foote's resolution," Dec. 29, 1829 (to restrict the sale of public lands), which provoked the debate (January, 1830) between Senators Hayne of South Carolina and Webster of Massachusetts.

FOOT GUARDS. Select regiments of infantry, organizations common to European armies. In the British army it includes the First, Second, and Third battalions of Grenadier Guards (q.v.), the First, Second, and Third battalions of Coldstream Guards (q.v.), the First, Second, and Third battalions of Scots Guards, and the Irish Guards, the First Battalion of which was formed in 1902. Like the German guard corps, they are not locally distributed throughout the Empire, but have permanent stations. See HOUSEHOLD TROOPS.

FOOTMAN MOTH. A name among British lepidopterists for the small yellowish-gray moths of the family Lithosiidæ, allied to the tiger moths.

FOOT POUND. The unit of work (q.v.) in the foot-poundal system, and corresponding to the amount of work required to raise one pound one foot vertically against the force of gravity at sea level in lat. 45°. See MECHANICAL UNITS.

FOOTPRINT, FOSSIL. See FOSSIL; ICHNOLOGY.

FOOT ROT. A hoof disease of sheep. Two varieties are recognized, the commoner consisting of an excessive growth of hoof, which at the toe or round the margin becomes turned down, cracked, or torn, and thus affords lodgment for sand and dirt. Irregular wearing of the hoof is the cause, and hence the prevalence of foot rot in soft rich pastures, and especially among sheep previously accustomed to bare, rough, or upland walks, where the hoof is naturally worn down by the greater amount of walking necessary to procure sustenance. Taken in time, when lameness is first apparent, and before the hoof is cracked and the foot inflamed, a cure rapidly follows the careful paring of the superfluous and diseased hoof; indeed, further treatment is scarcely necessary, unless the vascular parts have been laid bare, when a little tar may be applied as a mild astringent and protection from flies. When, from inattention or neglect, the hoof is separated from the sensitive parts beneath, when ulcers appear on the sole, or proud flesh develops, active astringents or mild caustics are necessary. Butter of antimony, diluted with an equal quantity of tincture of myrrh, is a good remedy when cautiously and temperately used. A convenient paste, which in inexperienced hands is safer than a fluid caustic, may be made with equal weights of flowers of sulphur and finely powdered sulphate of copper, rubbed up to the needed consistency with lard or oil. For the form of foot rot due to the necrosis bacillus a foot bath of a solution of copper sulphate is recommended. The second and more troublesome variety, instead of commencing at the ground surface, begins in the interdigital space or at the coronet and is contagious. The foot is hot, tender, and swollen around and immediately above the coronet. There are ulcerations in the interdigital space, and the swelling, and subsequently the appearance of proud flesh, cause a separation of the toes. When the tenderness and heat are great, poultices are advisable; but in the milder cases and earlier stages the parts should be well washed with a solution containing to the pint of water half an ounce each of sulphuric acid and oil of turpentine. When ulcers appear, they must be touched with lunar caustic, or dressed with the paste already recommended. Consult Melvin and Mohler, "Lip-and-Leg Ulceration of Sheep," *United States Department of Agriculture, Bureau of Animal Industry, Circular 160* (1910).

FOOTSCRAY, fŏŏts'krā. A city of Bourke Co., Victoria, Australia, on the Salt Water River, a suburb of Melbourne, 4 miles west of the city limits (Map: Victoria, D 5). It manufactures sugar, jute, soap, woolen goods, chemicals, and machinery, and its bluestone quarries furnish much of the material for the new buildings of Melbourne. It is one of the constituent towns of Greater Melbourne. Pop., 1901, 18,318; 1911, 23,643.

FOOTWALL. A term used in mining, to indicate the lower wall of an inclined ore body or coal seam. It underlies the ore body immediately and often serves as a slanting floor on which tracks can be laid for hauling up the ore. The upper wall or roof is known as the hanging wall. See MINING.

FOOT WASHING. A custom of the early Church, having its origin in necessities produced by Eastern climate and modes of dress and in the obligations attached to the rites of hospitality. In the most primitive times the feet were without covering, and sandals afforded protection only to the sole. Consequently, after any journey in the heat and sand, bathing the feet, if not absolutely required, was at least convenient and refreshing. Servants of a household were accustomed to perform this work for the guests, and thus it became a significant sign of humility. In memory and imitation of the example of Christ at the Last Supper (John xiii), the earliest Christians were accustomed to regard it as a praiseworthy act of piety. By the end of the fourth century it was specially connected with the observances of the Thursday before Easter, when, at least in the churches of Africa, Gaul, and Milan, it was the custom for the Bishop to wash the feet of the newly baptized with solemn ritual observances. When infant baptism became the rule, foot washing was dissociated from the administration of the sacrament; but as a liturgical custom observed on Maundy Thursday, it became more and more generally practiced. Augustine mentions it (*Epistle ad Januarium*). Earlier editions of the *Ordo Romanus* do not mention it, but the later ones speak of the Pope performing the ceremony for 12 subdeacons. As in monasteries where was a twofold observance, by the brethren among themselves and by the abbot and others for numerous poor people, so the Pope and other bishops added the washing of the feet of representative poor men, who also received food and gifts. It was also frequently, and is still in some courts (e.g., Vienna and Madrid), practiced by monarchs. At Rome, while the Gospel narrative is sung (from whose first words in Latin, *Mandatum novum*, 'a new commandment,' John xiii. 34, the name of Maundy or Mandate Thursday is derived), the representatives of the Apostles take their seats, dressed in white woolen tunics, and the Pope, in similar attire, sprinkles a few drops of water on the right foot of each, then wipes and kisses it. After this a repast is given, at which the Pope and his cabinet wait on the old men, who at the close take with them the tunics and towels, with the addition of a small gratuity in money. The Anabaptists, at the Reformation, continued the practice. The Moravians revived it, but without strictly enforcing it. In modern times it has been regularly practiced among the Dunkers (see Church of the Brethren), Winebrennerians, and the Glassites or Sandemanians. It is a part of the ceremonies of Easter week at Jerusalem, in the Russian church.

FOPPA, fôp'pȧ, Vincenzo (called Il Vecchio) (c.1427–1515). A Lombard painter of the Renaissance. He was born at Brescia and was probably a pupil of Squarcione at Padua and was later influenced by Bramante. According to his latest biographies, however, he received his early training at Verona. Little is known of his early life. About 1456 he removed to Pavia and was employed by the Sforzas in that city and in Milan, where he executed many important works. These were generally in fresco, and many have been destroyed. Among those surviving are the "Church Fathers" in the Portinari Chapel in San Eustorgio, the remaining frescoes in which are after his designs; "St. Sebastian," in the Brera, Milan; "St. Francis Receiving the Stigmata" and "St. Sebastian" and other frescoes, in the Castello Museum. His best panels are: "St. Jerome Praying" and a "Crucifixion," both at Bergamo; a fine altarpiece in Santa Maria di Castillo, Savona; "The Adoration of the Kings," in the National Gallery, London; and a "Deposition," in Berlin. His Madonnas resemble Bellini's, one of the best being in possession of Prince Trivulzio, Milan. Others are owned by Theodore Davis, Newport, R. I., and J. G. Johnson, Philadelphia. The last years of his life were spent at Brescia, whither he returned in 1489. Foppa is the founder of the Lombard school, and his influence was felt over the whole of northern Italy. His traditions, carried on by Borgognone, survived until Leonardo da Vinci's advent. Grandeur of form, impressive composition, shimmering silvery-gray color, and severe yet tender conception are the characteristics of his art. Consult his biography by Ffoulkes and Maiocchi (London, 1909), and Berenson, *North Italian Painters of the Renaissance* (New York, 1907).

FORAGE, in Agriculture. See Feeding Stuffs.

FOR'AGE (OF. *fourage*, Fr. *fourrage*, from OF. *forrer*, to forage, from *forre*, *fuerre*, Fr. *feurre*, from ML. *fodrum*, forage, from *voder*, AS. *fōdor*, Eng. *fodder*, OHG. *fuotar*, Ger. *Futter*, food; connected also with AS. *fōda*, Eng. *food*, and with Gk. *πατεῖσθαι*, *pateisthai*, to feed). In military usage, the food issued by the government for animals. In the United States army the forage ration for a horse, as provided in the Army Regulations, 1913, is 14 pounds of hay and 12 pounds of oats, corn, or barley; for a mule, 14 pounds of hay and 9 pounds of oats, corn, or barley. To each animal 3 pounds of bran may be issued in lieu of that quantity of grain. One hundred pounds of straw per month is allowed for each horse or mule. On the march grain is usually the only forage carried. Department commanders will reduce the ration when necessary. Where grazing is practicable, or when little labor is required, commanding officers are authorized to order a judicious reduction of the allowance. Forage is furnished only to mounted officers for the authorized number of horses owned and actually kept by them in the performance of their official duties when serving with troops in the field or at military posts and stations. When oats and hay, the usual ration, is not available, green forage, beans, peas, rice, *palay* (unshelled rice in the Philippines), wheat, or rye may be used. Wheat and rye should be crushed and fed sparingly (about one-fourth of the allowance). For unshelled corn add about one quarter by weight. In the cavalry a small reserve of grain—about six pounds—is carried on the horse. In the artillery a small reserve is carried on the carriages. Consult *Field Service Regulations, United States Army* (Washington, 1914).

FOR'AGING ANT. An ant of the Central American genus *Eciton*, usually called army ants in Nicaragua, because they go about in large bodies, making forays upon insects and other small animals. These columns may be three or four yards wide and include many thousands of individuals. As they march forward, smaller columns are pushed out ahead or on the flanks, which find and flush the prey. Larger animals flee; insects try to leap away, but more often jump into the midst of the ants, and even the largest are soon overpowered and torn to pieces. The ants explore thickets and brush heaps, driving everything to the twigs and then catching and pulling them down; but spiders often escape by letting themselves hang by a silken thread. Ant birds, ant thrushes, and their allies accompany such a foray through the forest, darting at the escaping insects, and feeding on the ants themselves. Several species of *Eciton* inhabit the American tropics, one of which devotes its excursions to harrying the nests of a certain small and timid ant (*Hypoclinea*), which it ousts from its galleries and robs of pupæ and larvæ, but does not otherwise injure. "The moving columns of *Ecitons* are composed almost wholly of workers of different sizes, but at intervals of two or three yards there are larger and lighter-colored individuals that will often stop, and sometimes run a little backward, halting and touching some of the ants with their antennæ. They look like officers giving orders and directing the march of the column."

These ants are of various species and differ in size, food, and methods of foraging. The

Ecitons are remarkable in having no permanent home. On the contrary, they make a temporary habitation in some hollow under a log or in the ground, where great masses cluster together like a hanging swarm of bees, in the centre of which the larvæ and pupæ are kept warm. These, with their nurses, seem to occupy a chamber within a living nest, and tunnel-like entrances are kept open along which food is carried by those left at work outside. Few ants show a greater sense of organization and mutual helpfulness than do these, and they seem to stand at the head of the tribe in point of intelligence. A circumstantial account of several species is given by Belt, in his *Naturalist in Nicaragua* (New York, 1911), from which the sketch here given has been condensed.

FORAIN, fō'răN', JEAN LOUIS (1852-). A noted French caricaturist, lithographer, etcher, and painter. He was born at Rheims and studied a short time under Gérôme at the Ecole des Beaux-Arts, but was largely self-taught, receiving his chief inspiration from Manet and Degas. One of the greatest draftsmen of his time, Forain is an unsurpassed master of elimination and suggestion and conveys a remarkable power of expression. His satire, though restricted in innuendo, penetrates to the very heart of the social, political, and judicial life of Paris, which he caricatures with refined but caustic wit. His first drawing appeared in *La Cravache* in 1876, and he later contributed to the *Figaro, Le Rire, Le Courrier Français,* and other periodicals. At the time of the Dreyfus agitation in 1898 he founded, with Caran d'Ache, the anti-Semitic periodical, *Psst*. His drawings, which have been published in album form, include *La comédie parisienne* (1892); *Les temps difficiles* (1893); *Doux pays* (1897). The Dresden Print Room contains the finest collection of his original lithographs and etchings. Among the best of the former are "The Strike," "Le Cabinet Particulier," "At the Folies-Bergère," "Papa's Pictures." His most noted etchings include "The Prodigal Son," "Mlle. Mere," and "The Prisoner and his Child." Forain's paintings are less important. Consult: Lehrs, "Forain," in *Die graphischen Künste* (Vienna, 1911); Guérin, *Forain, Lithographe* (Paris, 1910); Singer, "Lithographs and Etchings by Forain," in the *International Studio* (New York, 1909).

FOR'AKER, JOSEPH BENSON (1846-1917). An American Republican politician and legislator, born near Rainsboro, Highland Co., Ohio. Enlisting in 1862 as a private in the Eighty-ninth Ohio Volunteer Infantry, he was for a time aid to Maj. Gen. H. W. Slocum and in 1865 was brevetted captain. Immediately after the war he entered Ohio Wesleyan University, and two years later the junior class at Cornell University, where he graduated in 1869. He studied law and was admitted to the bar at Cincinnati, where he practiced with success until 1879, when he was elected a judge of the Superior Court. He resigned from the bench in 1882 and in 1885 was elected Governor of Ohio on the Republican ticket. He was reëlected in 1887, but was defeated for a third term in 1889, by James E. Campbell, although all the rest of the Republican State ticket was elected. From 1889 to 1897 he practiced law in Cincinnati. In 1897-1909 he was United States Senator. He was one of the most radical advocates of the war with Spain in 1898. He was a strong supporter of McKinley, but was opposed to many of Roosevelt's measures, in 1905 was one of the few members of Congress who openly opposed the regulation of railway rates by the Government, and in 1906-07 attacked Roosevelt for his action in the Brownsville case (see BROWNSVILLE, TEXAS) and attempted to turn the negro vote away from the President. The bill for the government of Porto Rico, in effect May, 1900, is called the Foraker Act. In May, 1914, Foraker announced that he would run again for the United States Senate, to clear himself of charges made by his political opponents in Ohio, based on testimony of Colonel Mulhall in 1913 before the Senate lobby investigating committee.